

**WAREHOUSING MANAGEMENT PRACTICES AND SUPPLY CHAIN
PERFORMANCE OF AGRICULTURAL FIRMS LISTED IN NAIROBI SECURITIES
EXCHANGE IN KENYA**

BY

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MASTER OF SCIENCE IN SUPPLY CHAIN MANAGEMENT

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OCTOBER, 2025

DECLARATION

I declare that this dissertation is my original work and has not been previously published or submitted elsewhere for the award of a degree. I also declare that this contains no material written or published by other people except where due reference is made and the author(s) duly acknowledged.

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ABSTRACT

The main aim of this study was to establish the influence of warehousing management practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study specifically sought to establish the influence of layout optimization practices, inventory control practices, storage management practices material handling practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study was anchored on the following theories: Systems Theory, Economic Order Quantity Theory, Resource-Based View Theory and Lean Management Theory. A descriptive-correlational research design was employed in the study. The target population comprised of 7 NSE listed agricultural firms in Kenya. The units of observation comprised of 112 respondents comprising of warehouse managers, supply chain managers, inventory controllers and operations managers. A census approach was employed to include all the listed agricultural firms while purposive sampling technique was employed in selecting the respondents of the study. Structured questionnaires formed the main data collection tool for the study. The data collected was analyzed through application of both descriptive and inferential statistics. The statistics were generated through Statistical Package for Social Sciences and results outlined in form of tables and figures. The study achieved a response rate of 70.5%. The study established that warehousing management practices positively and significantly correlates with supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The regression results established that layout optimization practices, inventory control practices, storage management practices material handling practices positively and significantly influence supply chain performance of agricultural firms. The study concluded that warehouse layout optimization, inventory control, storage management, and material handling practices significantly and positively influence supply chain performance among agricultural firms. The study recommended that agricultural firms strengthen warehouse layouts, adopt advanced inventory systems, enhance storage efficiency, and standardize material handling practices through modern technologies and automation to improve overall supply chain performance.

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ACRONYMNS AND ABRREVIATIONS

AS/RS	Automated Storage and Retrieval Systems
EOQ	Economic Order Quantity
FMCG	Fast-Moving Consumer Goods
NACOSTI	National Commission for Science, Technology, and Innovation
NSE	Nairobi Securities Exchange
RBV	Resource-Based View
SAFSC	South African Food Sovereignty Campaign
SPSS	Statistical Package for Social Scientists
WMS	Warehouse Management Systems

OPERATIONAL DEFINITIONS OF TERMS

Inventory control practices- Refer to the systematic monitoring and regulation of stock levels to ensure that demand is met without overstocking or understocking (Yousfani et al., 2023)

Material handling practices- Refers to the methods and procedures used to move goods within the warehouse from receiving and storage to picking and dispatching (Kimathi & Wachiuri, 2021).

Storage management practices- Involves the adoption of appropriate storage conditions, such as temperature control, humidity regulation, and segregation of products based on their characteristics (Odhiambo & Jaoko, 2016)

Supply chain performance - Refers to the extent to which an organization's supply chain processes effectively to achieve desired outcomes in meeting customer needs, improving responsiveness, reducing costs, and creating value across the supply network (Ramos, 2022)

Warehouse layout optimization - Refers to the strategic arrangement of storage areas and equipment within the warehouse to promote efficiency in operations (Ikegwuru & Chinyere, 2020)

Warehousing management practices – Refers to the structured approaches, and techniques employed by firms to plan, organize, and control the storage and movement of materials within and outside the warehouse in order to optimize supply chain performance (Kisinga et al, 2024)

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Agricultural firms form cornerstones of many economy by contributing significantly to food security, employment creation, and foreign exchange earnings through exports (Eichsteller et al, 2022). Efficient supply chain performance within the agricultural sector is vital for ensuring timely delivery of produce, cost efficiency, and competitiveness in both local and international markets. A well-managed supply chain, as highlighted by Kwamega et al (2018) enhances organizational performance by reducing wastage, improving order fulfillment, and strengthening responsiveness to fluctuating market and consumer demands. Warehousing management practices play a central role in the agricultural supply chain by facilitating proper storage, preservation, and movement of goods. Effective warehousing ensures quality maintenance of perishable and non-perishable agricultural products, and improves traceability across the supply chain (Shree, 2025).

Warehousing management practices play a critical role in shaping supply chain performance across different industries and countries. Globally, agricultural firms such as Dole in the United States have invested heavily in advanced warehousing technologies to enhance efficiency and reduce losses. The firms rely on Warehouse Management Systems (WMS), Automated Storage and Retrieval Systems (AS/RS), and cold-chain facilities to optimize their operations (DOLE, 2021). The adoption of WMS provides real-time inventory visibility, accurate tracking of lots, and improved order accuracy, while AS/RS enables higher throughput and reduced dependence on manual labour. In addition, cold-chain facilities and ripening rooms safeguard the quality of perishable produce, reduces spoilage and ensuring freshness at delivery points. As a

result, these warehousing practices translate into higher productivity and improved responsiveness to demand which collectively strengthen supply chain performance.

In South Africa, firms such as Senwes have developed extensive silo networks, drying and conditioning facilities, and integrated market-access platforms that combine storage with trading services. The use of aeration systems, conveyor handling technologies, and moisture monitoring helps to preserve grain quality over long periods (SAFSC, 2023). The practices have reduced post-harvest losses and extended the shelf life of commodities thereby enhancing buyer confidence in commodity trading. Furthermore, storage infrastructure enables farmers and firms to time their sales more strategically, capturing better prices and ensuring consistent market supply. Consequently, warehousing management in the firms as noted by Mabotja (2024) has a direct influence on supply chain performance as it improves product quality, reducing losses, and strengthening market competitiveness.

In Kenya, both agricultural and non-agricultural firms demonstrate a diverse range of warehousing management practices that significantly affect supply chain performance. For example, Twiga Foods has invested in centralized aggregation centers and cold storage facilities that reduce post-harvest losses and guarantee timely deliveries of fresh produce to urban retailers (Chege et al, 2023). Similarly, Bidco Africa as highlighted by Mwangi (2016) relies on centralized collection and farmer contracting systems to ensure a steady supply of raw materials for its processing plants, thereby reducing variability and enhancing production reliability. Beyond agriculture, manufacturing and FMCG companies have also introduced advanced warehousing practices. Unilever East Africa, for instance, established a state-of-the-art automated warehouse in Nairobi equipped with AS/RS and modern WMS, which has improved order fulfilment accuracy and reduced lead times (African Marketing Confederation, 2023).

1.1.1 Warehousing Management Practices

Warehousing management practices constitute a critical component of modern supply chain systems which serves as the foundation upon which firms store, handle, and distribute goods efficiently. Warehousing management practices is defined as the structured approaches, and techniques employed by firms to plan, organize, and control the storage and movement of materials within and outside the warehouse in order to optimize supply chain performance (Kisinga et al, 2024). Effective warehousing goes beyond the simple function of storage and ensures that goods are received, handled, preserved, and dispatched in a manner that reduces costs, minimizes waste, and maximizes responsiveness to market demand (Maalim & Moronge, 2018). For agricultural firms listed on the Nairobi Securities Exchange, warehousing management practices are especially vital, given the perishable nature of many agricultural products, the seasonal fluctuations in supply, and the need to meet stringent quality and safety standards in both local and export markets.

One key aspect of warehousing management practices is warehouse layout optimization. This involves the strategic arrangement of storage areas, workstations, and equipment within the warehouse to promote efficiency in operations (Ikegwuru & Chinyere, 2020). An optimized layout reduces the time and effort required to locate, pick, and move goods, thereby minimizing delays in order fulfillment. For agricultural firms, this is particularly important in reducing spoilage by ensuring quick retrieval and dispatch of products. A well-structured layout also enhances space utilization which allow firms to store more goods without the need for expansion. Practices such as slotting, zoning, and cross-docking fall within layout optimization and enables firms to align their warehousing structure with their operational priorities.

Another central aspect is inventory control practices, which refer to the systematic monitoring and regulation of stock levels to ensure that demand is met without overstocking or

understocking (Yousfani et al., 2023). Effective inventory control employs tools such as just-in-time systems, and economic order quantity to balance holding costs against service levels. For agricultural firms, accurate inventory control is crucial in managing the challenges of perishability and demand volatility. Overstoring perishable agricultural goods can lead to massive losses, while stockouts may result in missed sales opportunities and dissatisfied customers. Robust inventory management systems are often integrated to enhance accuracy and visibility (Atnafu et al., 2018).

Storage management practices is another aspect of warehousing management practices which focus on how goods are preserved within the warehouse to maintain their quality, safety, and accessibility. Storage management involves the adoption of appropriate storage conditions, such as temperature control, humidity regulation, and segregation of products based on their characteristics (Odhiambo & Jaoko, 2016). For instance, cereals, fruits, and dairy products require different storage conditions to maintain their integrity. Agricultural firms often deal with products destined for both local and international markets which necessitates adherence to global storage standards. Proper storage practices according to Njoroge (2022) minimize spoilage, contamination, and product deterioration, thereby safeguarding the firm's reputation while enhancing overall supply chain performance.

In addition, material handling practices form a critical pillar of warehousing management. Material handling refers to the methods, equipment, and procedures used to move goods within the warehouse from receiving and storage to picking and dispatching (Kimathi & Wachiuri, 2021). Efficient material handling practices reduce product damage, labor costs, and turnaround time. The practices encompass both manual techniques and mechanized systems, including forklifts, conveyors, pallet jacks, and automated guided vehicles. In agricultural firms, material handling practices must be designed with the fragility and perishability of products in mind, ensuring that

items are transported gently and quickly to preserve quality. Moreover, proper handling according to Kisioya and Moronge (2019) enhances worker safety and ensures compliance with occupational health and safety standards.

1.1.2 Supply Chain Performance in Agricultural Firms

Supply chain performance according to Ramos (2022) refers to the extent to which an organization's supply chain processes effectively and efficiently achieve desired outcomes in meeting customer needs, improving responsiveness, reducing costs, and creating value across the supply network. In agricultural firms, supply chain performance is critical because agricultural products are often perishable, seasonal, and highly sensitive to both time and quality factors. Effective supply chain performance in the firms ensures that products reach markets in good condition, within the required timelines, and at an optimal cost, thus enhancing competitiveness and profitability (Osoro, 2024).

One important aspect of supply chain performance is warehousing cost efficiency, which entails managing storage and handling costs while maintaining product quality and availability (Mwizerwa & Akumuntu, 2024). For agricultural firms, efficient warehousing practices mean minimizing costs related to storage, inventory holding, and handling without compromising freshness and safety of produce. This requires adoption of modern warehousing technologies, space optimization, and reduction of wastages to ensure that resources are used productively and in alignment with organizational goals. Effective cost efficiency in warehousing also enhances competitiveness by enabling firms to offer timely and affordable products in the market. Moreover, the efficiency according to Mani et al., (2023) strengthens overall supply chain resilience, as resources saved through efficiency can be reinvested in other critical areas such as distribution and quality improvement.

Another dimension of supply chain performance is the order fulfillment cycle time, which measures the speed and accuracy with which customer orders are processed and delivered (Lin & Shaw, 2018). In agricultural supply chains, where demand may fluctuate seasonally and consumers expect timely delivery of fresh produce, shorter and more reliable order fulfillment cycles are vital. Firms are able to enhance customer satisfaction and retain competitiveness in dynamic markets through streamlining order processing, automating tracking systems, and coordinating closely with distributors and retailers. Effective management of order fulfillment also minimizes post-harvest losses by ensuring products reach the market while still fresh. Furthermore, it enables firms to build trust and long-term relationships with buyers, which is essential for sustaining supply chain resilience (Tulli & Krishna, 2019).

Distribution lead time aspect reflects the duration between when an order is placed and when the product is delivered to the customer (Mohammed & Mandal, 2024). For agricultural firms, lead time is a key determinant of both product quality and customer trust. Delays in distribution can lead to spoilage, loss of market value, and reduced consumer confidence. Hence, firms must prioritize efficient logistics, use of reliable transportation, and effective coordination with supply chain partners to minimize distribution lead times while ensuring that goods arrive in the desired condition. Shorter lead times also provide firms with a competitive advantage by enabling them to respond quickly to fluctuations in market demand. Moreover, consistent adherence to optimal lead times fosters stronger relationships with buyers and enhances overall supply chain performance (Chang & Lin, 2019).

1.1.3 Agricultural Firms

Agricultural firms are enterprises engaged in the production, processing, distribution, and marketing of agricultural commodities such as crops, livestock, and value-added food products

(Kabubo & Karanja, 2017). In the Kenya, agricultural firms are significant contributors to the national economy as they operate at both domestic and international levels, supplying food, raw materials, and foreign exchange earnings. The firms often engage in large-scale farming, agro-processing, input supply, and export of high-value crops such as tea, coffee, horticultural produce, and floriculture, which are among Kenya's leading foreign exchange earners.

Agricultural firms operate within a highly dynamic and often challenging environment. The operational environment is influenced by factors such as climate variability, fluctuating global commodity prices, regulatory frameworks, technological advancements, and competition in both local and international markets (Nguyen, 2023). Political stability, infrastructure quality, and access to financing also play a critical role in shaping the performance and sustainability of the firms. To remain competitive, agricultural firms must adapt to market demands, embrace innovation, and comply with international standards related to quality, safety, and sustainability.

Within this operational framework, warehousing management practices emerge as a critical factor for agricultural firms. Warehousing enables the storage of agricultural commodities in appropriate conditions to preserve quality, reduce post-harvest losses, and ensure timely supply to markets (Karimi & Osoro, 2025). Effective warehousing practices facilitate inventory control, enhance supply chain responsiveness, and allow firms to balance supply and demand fluctuations, especially for seasonal products. The practices also support value addition activities such as sorting, grading, packaging, and cold storage, which are vital for meeting export market requirements. Moreover, warehousing reduces transaction costs by consolidating shipments and improving transportation planning. In an environment where market volatility and perishability are constant challenges, robust warehousing management practices enhance operational efficiency, and long-term sustainability of agricultural firms.

1.2 Statement of the Problem

Kenya's economy depends heavily on agriculture, which also provides jobs, food security, and foreign exchange profits. This industry depends heavily on a number of agricultural companies listed on the Nairobi Securities Exchange, which demonstrate investor confidence and support the expansion of the national economy (Kilonzo & Nkuru, 2023). Despite their importance, these firms face persistent supply chain challenges that compromise operational efficiency, profitability, and overall competitiveness. Specifically, poor warehousing and inventory management practices manifested through inadequate storage facilities, inefficient handling processes, high post-harvest losses, and inconsistent stock availability have been identified as major bottlenecks (Wainaina, 2021; Kirci et al., 2022). For instance, seasonal production fluctuations often lead to stockouts during peak periods and overstocking during low-demand periods, directly affecting the ability of NSE-listed firms to meet market demand and maintain product quality.

The consequences of these inefficiencies are quantifiable: delayed deliveries, excessive lead times, higher holding and operational costs, and diminished responsiveness to market changes. Such weaknesses have direct implications for the financial performance of listed agricultural firms, including reduced profitability and shareholder value, thus posing a threat to their sustainability in both domestic and international markets (Njiru, 2024). The issue is made worse by the lack of systematic implementation of contemporary warehousing management approaches that have been demonstrated to increase the efficiency of supply chains in other contexts, including automation, real-time stock tracking, and quality-preserving storage procedures (Karimi & Osoro, 2025).

Existing literature underscores the potential of warehousing management practices to enhance supply chain performance. For example, Batarlienė and Jarašūnienė (2024) found that

automation and information systems improve warehouse operational efficiency, while Oluka and Ugochukwu (2024) observed a positive relationship between warehouse management practices and firm performance in Nigerian pharmaceutical companies. Maalim and Moronge (2018) reported similar findings within Kenyan state enterprises, specifically at the Kenya Airports Authority. However, these studies do not address the context of NSE-listed agricultural firms in Kenya, which face unique challenges such as perishability of products, seasonal supply variations, and stringent quality standards for both domestic and export markets.

Therefore, there is a critical knowledge gap regarding how warehousing management practices influence the supply chain performance of agricultural firms listed on the NSE. Addressing this gap is essential to identify targeted interventions that can reduce post-harvest losses, improve inventory handling, and enhance operational efficiency, ultimately supporting these firms in sustaining competitiveness, profitability, and shareholder value in a dynamic market environment.

1.3 Objectives of the Study

1.3.1 General Objective of the Study

The general objective of the study was to establish the influence of warehousing management practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya

1.3.2 Specific Objectives of the Study

- i To establish the influence of warehouse layout optimization practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya
- ii To find out how inventory control practices influences supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya

- iii To examine the influence of storage management practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya
- iv To find out how material handling practices influences supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya

1.4 Research Questions

- i To what extent does warehouse layout optimization practices influence supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya?
- ii To what extent does inventory control practices influence supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya?
- iii To what extent does storage management practices influence supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya?
- iv To what extent does material handling practices influences supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya?

1.5 Significance of the Study

1.5.1 Management of NSE Listed Agricultural Firms

The study provides valuable insights into how effective warehousing practices such as inventory control, warehouse layout optimization, technology adoption, and storage handling contribute to improved supply chain performance. Managers can use the findings to streamline operations, reduce costs associated with stockouts and wastage, and enhance customer satisfaction through timely delivery. The study therefore equips management with evidence-based strategies for improving operational efficiency and competitive advantage in the agricultural sector.

1.5.2 Agricultural Policy Makers

The study offers empirical evidence to the agricultural policy makers on the role of warehousing in strengthening agricultural supply chains. Given that inefficiencies in warehousing often lead to post-harvest losses, delayed exports, and reduced foreign exchange earnings, the study's findings can guide the formulation of policies that promote investment in modern warehousing infrastructure and logistics systems. Policy makers can also use the insights to design regulations and incentives that encourage agricultural firms to adopt best warehousing practices, thereby enhancing food security and agricultural competitiveness at both local and international levels.

1.5.3 Researchers

The study contributes to the existing body of knowledge by bridging the gap between warehousing management and supply chain performance in listed agricultural firms in Kenya. The study provides a foundation upon which future studies can build. Furthermore, the findings can stimulate comparative studies across different sectors or countries, thereby advancing academic and practical understanding of supply chain management.

1.6 Scope of the Study

The study will focus on establishing the influence of warehousing management practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The warehousing management practices that were focused in the study comprised of warehouse layout optimization practices, inventory control practices, storage management practices and material handling practices. The study adopted a descriptive-correlational design and targeted NSE listed agricultural firms. The target population comprised of 7 NSE listed agricultural firms in Kenya. The units of observation comprised of 112 respondents comprising of warehouse

managers, supply chain managers, inventory controllers and operations managers. The study utilized questionnaires for collecting data after which both descriptive and inferential statistics were employed in analyzing the collected data. The study is projected to take four months between September and December 2025.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter contains a discussion of the literature review of the study. The chapter outlines the theoretical review which presents the various theories anchoring the study. The chapter additionally provides a review of past studies that have been conducted in respect to the various variables of the study in the empirical literature review section. A conceptual framework is further outlined followed by variables conceptualization and finally a discussion on the research gaps of the study.

2.2 Theoretical Review

A theory is a formulation that, while staying within the bounds of crucial limiting assumptions, explains, predicts, comprehends, challenges, and expands on current knowledge. According to Yin et al. (2025), a theory is a claim that is backed up by data and intended to explain specific occurrences. When choosing which statistical variables to measure, the investigation is guided by a theoretical framework. The study was guided by the following theories: Systems Theory, Economic Order Quantity Theory, Resource-Based View Theory and Lean Management Theory.

2.2.1 Systems Theory

Systems theory, proposed by biologist Ludwig von Bertalanffy in 1950 provides a broad framework for understanding how different parts of an organization interact as an integrated whole. The central premise of the theory is that organizations, like living organisms, are made up of interrelated components that must work together harmoniously to achieve optimal performance

(von Bertalanffy, 1950). Rather than viewing each unit or function in isolation, systems theory emphasizes the interconnectedness, interdependence, and synergy of all elements within a system. This holistic approach argues that the performance of the entire system cannot be understood merely by analyzing the individual parts; instead, it emerges from the dynamic interactions among these parts.

According to systems theory, organizations are considered open systems that continuously interact with their internal and external environments. Inputs, such as resources, information, and technology, flow into the system, undergo transformation processes, and are converted into outputs in the form of products, services, or performance outcomes. Feedback loops enable the system to self-regulate, adapt, and improve over time (Baecker, 2001). In agricultural firms, systems theory suggests that warehousing management practices, supply chain operations, and external market conditions form an interconnected structure where improvements or inefficiencies in one component affect the overall performance of the system.

While systems theory provides a useful holistic lens for analyzing warehousing management practices and supply chain performance, it has been criticized for being overly abstract and lacking prescriptive guidelines for practical implementation. Scholars argue that the theory tends to emphasize interdependencies without offering concrete mechanisms for addressing complexities in dynamic environments such as globalized supply chains (Skyttner, 2023). Moreover, the assumption that all subsystems can harmoniously integrate oversimplifies real-world challenges, especially in agricultural supply chains characterized by uncertainty, perishability, and fluctuating market conditions. This limitation suggests that while systems theory highlights the importance of interconnectedness, it may not adequately equip managers with actionable strategies for solving operational bottlenecks.

This theoretical perspective helps in explaining the influence of warehouse layout optimization practices on supply chain performance. A warehouse is not merely a storage facility but a critical subsystem within the broader supply chain system. The way a warehouse is organized, its layout, design, and flow of goods affects other processes such as inventory management, transportation, order fulfillment, and customer service (Cagliano et al, 2011). For example, a poorly designed warehouse layout that causes delays in locating or retrieving products disrupts distribution schedules, increase operational costs, and reduce overall supply chain efficiency. Conversely, a well-optimized layout minimizes handling times, reduces errors, and ensures smooth movement of goods, thereby enhancing responsiveness and reliability across the supply chain.

The theory views warehouse layout optimization as an integral element in the agricultural supply chain system. Since agricultural products are often perishable and time-sensitive, efficiency in warehouse layout becomes even more critical. Optimized layouts as noted by Berg and Zijm (2009) facilitate quick access, effective space utilization, and streamlined operations, which directly contribute to reduced wastage and faster order processing. By guaranteeing that goods are delivered to the market in a swift and economical manner, the enhancements boost supply chain performance.

2.2.2 Economic Order Quantity Theory

EOQ theory is a traditional inventory management approach that offers a framework for figuring out the ideal order size to reduce overall inventory expenses. It was first put up by Ford Whitman Harris in 1913. Finding a balance between ordering costs and holding costs is the main idea behind the EOQ approach. Every time a new order is placed, regardless of the quantity, ordering costs are the fixed expenses incurred (Wettasinghe & Lankapura, 2024). These can include administrative costs, transportation fees, and the labor involved in placing and receiving

an order. In contrast, holding costs are the expenses associated with storing inventory. These costs increase as the order quantity grows and can include warehouse rent, insurance, spoilage, and the opportunity cost of having capital tied up in stock.

According to the notion, the sum of these two expenses is at its lowest for a particular order quantity. Whereas placing fewer orders in greater amounts lowers ordering costs but raises holding costs, placing more frequent orders in smaller numbers lowers holding costs but raises ordering costs. The EOQ formula minimises the overall cost by pinpointing the precise point at which these two expenses are equal (Alnahhal et al, 2024). Although EOQ remains one of the most widely applied inventory models, critics argue that its assumptions are unrealistic in contemporary supply chain environments. The model assumes constant demand, fixed lead times, and uniform holding and ordering costs, which rarely hold true in volatile agricultural markets (Boute et al., 2021). Agricultural products are highly perishable, and demand is often seasonal, making the rigid EOQ framework less adaptable. Furthermore, EOQ does not integrate modern considerations such as supply chain disruptions, sustainability concerns, and real-time data analytics, which are increasingly shaping inventory decisions (Govindan & Cheng, 2022). Hence, while EOQ provides a foundational understanding of balancing inventory costs, it risks oversimplification in complex, dynamic supply chain contexts.

Agricultural products have a high holding cost due to a short shelf life and the need for specialized storage. According to Oboge et al (2024), firms can optimize their inventory control practices to reduce waste and spoilage by applying the EOQ theory. By calculating the EOQ for various products, a firm can determine the ideal order size to maintain a consistent supply while avoiding overstocking, which would lead to spoilage and a reduction in profitability. The theory

helps to link efficient inventory control practices, such as minimizing total inventory costs, with improved supply chain performance metrics like profitability and product availability.

2.2.3 Resource-Based View Theory

Birger Wernerfelt developed the Resource-Based View (RBV) hypothesis in 1984. It states that a firm's ability to maintain a competitive edge and perform better is mostly based on the special resources and skills it has and uses well (Wernerfelt, 1984). According to the theory, resources are the assets, organisational traits, practices, and data that a business has control over and that enable it to create and carry out plans that improve its effectiveness and efficiency. The idea also highlights that not all resources offer a competitive edge; rather, enterprises can attain long-term superior performance by utilising resources that are precious, scarce, unique, and non-replaceable (Kraaijenbrink et al, 2010).

In the study, storage management, which includes activities such as inventory control, warehousing layout, temperature and humidity regulation, and use of modern storage technologies, can be viewed as a unique organizational capability. When firms invest in well-structured storage systems, adopt innovative technologies, and establish efficient handling procedures, these practices become strategic resources that contribute to minimizing post-harvest losses, reducing costs, and ensuring timely availability of products along the supply chain (Komakech et al, 2025). Such resources are not easily imitated by competitors, especially when they are tailored to the unique needs of the firm, such as the handling of perishable agricultural products.

The RBV has been influential in linking unique organizational resources to competitive advantage, but it has also faced criticism for its limited dynamic perspective. Critics argue that RBV is static in nature, focusing primarily on resource possession rather than the processes by which resources are renewed, reconfigured, or leveraged in rapidly changing environments

(Peteraf et al., 2022). In agricultural supply chains where external shocks such as climate variability and policy changes are frequent, the RBV's emphasis on internal resources may downplay the role of adaptability and external networks. Furthermore, it has been critiqued for its tautological reasoning—firms are considered successful because they possess valuable resources, and resources are deemed valuable because successful firms possess them (Kozlenkova et al., 2014). Thus, while RBV highlights the strategic role of storage management, it may understate the importance of dynamic capabilities in sustaining supply chain performance.

The RBV theory supports the study objective by demonstrating that the effectiveness of supply chain performance in agricultural firms depends not only on external market conditions but also on how internal resources, such as storage management practices, are configured and deployed. Agricultural firms listed on the Nairobi Securities Exchange face intense competition, both domestically and globally. The firms can reduce inefficiencies, enhance product quality, improve customer satisfaction, and achieve higher operational performance compared to competitors who lack such capabilities by leveraging superior storage management practices as a strategic resource (Ceyhun, 2020). Thus, RBV underscores the idea that well-managed storage systems are not just operational necessities but also critical strategic assets that can yield sustainable competitive advantage and drive overall supply chain performance.

2.2.4 Lean Management Theory

Lean Management Theory was developed by Taiichi Ohno in 1950 and posits that organizations should maximize customer value while minimizing resource use (Aripin, 2023). This is achieved through principles such as waste reduction, process standardization, value stream mapping, just-in-time production, and continuous improvement. The theory identifies seven forms of waste comprising of overproduction, waiting, transportation, overprocessing, excess inventory,

unnecessary motion, and defects and stresses the importance of designing processes that reduce these inefficiencies. Firms are able to deliver higher quality, greater speed, and improved flexibility at lower cost through aligning operations with these principles.

One critique is that lean practices often prioritize cost reduction and efficiency over resilience and flexibility, making supply chains vulnerable to disruptions such as pandemics or geopolitical shocks (Simangunsong et al., 2023). Moreover, lean implementation requires cultural change, employee buy-in, and continuous commitment, which may not be feasible in resource-constrained agricultural firms (Tortorella et al., 2022). Additionally, an overemphasis on just-in-time principles can be problematic in agricultural settings where demand is highly variable, and buffer stocks are often necessary to manage uncertainty. Thus, while lean offers significant efficiency gains, it must be complemented with resilience strategies to avoid fragility in agricultural supply chains.

In the study, material handling involves the movement, storage, control, and protection of goods within warehouses and throughout the supply chain. Inefficient material handling according to Mashaei and Lennartson (2012) often results in wasted time, excessive movement, product damage, and delays, all of which negatively affect supply chain performance. Lean principles advocate for streamlining these processes by reducing unnecessary handling steps, minimizing transit times, adopting standardized procedures, and leveraging automation and layout optimization. For instance, the use of just-in-time principles reduces excessive inventory handling, while visual management tools help ensure smooth material flow within warehouses.

Agricultural can enhance their supply chain performance through more efficient and responsive warehousing practices through application of the theory's principles. Agricultural products require highly efficient material handling to maintain quality and reduce spoilage. Lean

principles ensure that the products are moved quickly and efficiently through the supply chain thus minimizing delays and reducing operational costs (Yamazaki, 2017). Furthermore, the theory's emphasis on continuous improvement encourages agricultural firms to constantly evaluate and refine their warehousing processes, ensuring long-term competitiveness in a highly dynamic market environment.

2.3 Empirical Review

The section discusses past studies conducted on warehousing management practices and supply chain performance in different contexts globally and locally. Studies are reviewed with a purpose to create a study critique and establish research gaps from the past studies upon which the current study is built on. Empirical review is conducted per study objective.

2.3.1 Warehouse Layout Optimization Practices and Supply Chain Performance

Mohamud et al. (2023) examined how warehouse characteristics, specifically layout and operations, influence warehouse efficiency. The study found that efficient warehouse layout and operations positively affect overall warehouse performance, demonstrating that both structural design and operational processes are critical to improving efficiency. However, the study was largely literature-based and did not focus on agricultural firms in Kenya. This presents a contextual gap that this study intends to address by examining warehouse layout optimization specifically in agricultural firms listed on the Nairobi Securities Exchange.

Ikegwuru and Chinyere (2020) investigated the relationship between warehouse optimization and customer satisfaction in large industrial companies in Rivers State, Nigeria. Using a descriptive survey of 296 retailers, the study concluded that optimized warehouse layouts significantly enhance customer satisfaction. Despite these findings, the study was conducted in a foreign context and focused on large-scale manufacturing firms rather than agricultural firms in

Kenya. This research filled the contextual gap by exploring the link between warehouse layout optimization and supply chain performance within Kenyan agricultural firms.

Kibet et al. (2024) studied the influence of warehouse structure on the performance of distribution companies in Kenya. Employing descriptive and explanatory designs, the study revealed that improvements in warehouse layout positively correlate with better company performance, with regression analysis indicating a 0.732 increase in performance per unit improvement in layout. However, the study generalized warehouse structure without specifically examining agricultural firms. By placing warehouse layout optimisation in the context of the Nairobi Securities Exchange-listed agriculture industry, this study seeks to close this gap.

At Bollore Africa Logistics Ltd. in Nairobi, Ngera (2014) examined the results of operational optimisation and third-party warehouse designs. In comparison to specialised or class-based storage systems, the study discovered that random storage warehouses were less space-efficient and had poorer worker productivity. While informative, the study focused on third-party logistics rather than agricultural firms, leaving a gap in understanding how warehouse layout optimization impacts the supply chain performance of listed agricultural firms, which this study seeks to address.

2.3.2 Inventory Control Practices and Supply Chain Performance

Yousfani et al. (2023) investigated how supply chain performance at private hospitals in Hyderabad, Pakistan, was impacted by inventory management methods, such as control systems for inventory, levels of inventory, and warehouse operations. Using 200 questionnaires and analysis via multiple regression and principal component analysis, the study confirmed that inventory control practices positively impact supply chain performance. While these findings highlight the importance of structured inventory management, the context is healthcare in Pakistan,

leaving a contextual gap for agricultural firms in Kenya, where inventory dynamics are influenced by perishability, seasonality, and local regulatory requirements.

A study by Atnafu et al. (2018) looked at how inventory management techniques affected the performance and competitiveness of 188 micro and small manufacturing businesses. According to structural equation modelling, competitiveness is increased by efficient inventory management, and increased competitiveness leads to improved organisational performance. However, the study's focus on micro and small enterprises does not adequately reflect the operations of listed agricultural firms in Kenya, which may have larger-scale inventory and supply chain complexities. Therefore, the study highlights the need to evaluate inventory control practices in the agricultural sector to identify context-specific strategies for enhancing supply chain performance.

Sugut and Ondara (2023) investigated inventory management practices in Nairobi City County, focusing on JIT, MRP, and economic order quantity, with a sample of 183 procurement officials. Findings showed that these practices positively influence supply chain performance, although some practices had negligible effects. The mixed results indicate a methodological and conceptual gap, suggesting that further sector-specific research is needed to determine the most effective inventory management strategies for agricultural firms listed on the Nairobi Securities Exchange.

Sugut and Ondara (2023) evaluated inventory management practices in Nairobi City County and found that JIT, MRP, and economic order quantity positively influenced supply chain performance, though strategic supplier relationships had negligible effects. The study highlighted

that some inventory practices may not significantly impact performance, indicating a conceptual and methodological gap. This study addressed the gap by identifying which inventory practices are most effective for agricultural firms listed on the Nairobi Securities Exchange.

Mwakima and Osoro (2024) studied inventory management practices in logistics companies in Nairobi City County. Using a descriptive survey and stratified random sampling of 171 respondents, the study found that cross-docking and demand forecasting significantly improved logistics performance. Despite providing local evidence, the study focused on logistics companies rather than agricultural firms, highlighting a sectoral gap in understanding the role of inventory control in agricultural supply chains.

2.3.3 Storage Management Practices and Supply Chain Performance

Kisinga et al. (2024) investigated warehouse management practices in small-scale grape processing companies in Dodoma, Tanzania, focusing specifically on storage management techniques. The study employed descriptive statistics on survey data from 202 businesses and found that effective storage management significantly enhanced company performance. The research highlighted that prioritizing storage practices over less impactful areas like packaging could improve sustainability and competitiveness. However, grape processing differs in product type, perishability, and scale from agricultural firms listed on the Nairobi Securities Exchange, suggesting that the storage strategies optimal for one context may not directly translate to the other. This identifies a contextual gap, emphasizing the need for research into how storage management practices, such as cold storage for perishable crops, humidity control for grains, and optimized shelf arrangement, affect supply chain performance in Kenyan agricultural firms.

Odhiambo and Jaoko (2016) examined the effectiveness of different storage systems in enhancing organizational performance by comparing two supermarkets in Kisumu City. Their

findings demonstrated that supermarkets employing a mix of automated storage, random access storage, closed storage, and open storage systems experienced improved operational efficiency and reduced product loss. Despite the valuable insights, the study focused on retail supermarkets rather than agricultural production and distribution firms, leaving a sectoral gap.

Njoroge (2022) investigated the connection between cold supply chain management and financial performance in pharmaceutical firms listed on the Nairobi Securities Exchange. Using a mixed-methods approach, the study collected secondary financial data and survey responses from supply chain managers, concluding that efficient cold storage practices significantly reduced product losses and enhanced financial performance. While these results underline the importance of precise storage management, pharmaceuticals differ from agricultural products in terms of handling requirements, perishability timelines, and regulatory environments. This highlights a contextual gap and the necessity to explore storage practices in agricultural firms, particularly for perishable crops like fruits, vegetables, and dairy, which require rapid turnover and precise environmental control to maintain quality, minimize losses, and enhance supply chain performance.

2.3.4 Material Handling Practices and Supply Chain Performance

Tanveer et al. (2022) studied the relationship between material management and the operational performance of textile manufacturing firms in Islamabad, Pakistan. Through structured questionnaires across six textile firms, they found that effective material management—including planning, scheduling, and coordination of materials flow—positively impacted performance. Material handling practices were linked to reduced production delays, minimized wastage, and enhanced operational efficiency. However, textile manufacturing involves relatively durable raw materials and predictable production flows, unlike agricultural products, which are perishable and

require more sensitive handling. This highlights a sectoral gap, suggesting the need to examine how material handling practices affect the supply chain performance of agricultural firms.

Chidebe (2023) analyzed material management in 66 registered pharmaceutical manufacturing firms in South-East Nigeria, with results showing that while material planning strategies had little effect on net profit, logistics management significantly improved sales volume and return on equity. The study underscores that certain aspects of material handling have a more direct impact on performance than others. For agricultural firms, similar investigations could identify which specific practices maximize efficiency, reduce post-harvest losses, and enhance the overall supply chain performance.

Kimathi and Wachiuri (2021) focused on Mount Kenya Dairies, employing a descriptive survey design on 58 purposively sampled employees. Results indicated a significant and positive correlation between sustainable material handling practices, such as coordinated internal transport, ergonomic handling systems, and efficient storage-to-production flow, and organizational performance. Despite strong results, the study concentrated on dairy products and did not generalize to other agricultural commodities, which may differ in fragility, perishability, and storage requirements.

Kisioya and Moronge (2019) examined material handling practices in 188 large manufacturing enterprises in Nairobi and found positive effects on organizational performance. The study focused on manufacturing firms producing durable goods, which limits the applicability of findings to agricultural firms where product perishability and bulk present unique challenges. Research on listed agricultural firms explores the integration of mechanized handling systems to improve supply chain responsiveness, reduce post-harvest losses, and enhance overall performance.

2.4 Conceptual Framework

A conceptual framework, according to Sale and Carlin (2025), is an extensive compilation of ideas and tenets derived from pertinent academic disciplines that are utilised to structure a subsequent presentation. It is an analytical method for organising concepts and making conceptual distinctions that can be applied in a number of settings and variations. The relationship between the study's independent variables (warehouse layout optimization practices, inventory control practices, storage management practices and material handling practices) and dependent variable (supply chain performance) is depicted in the conceptual framework in Figure 1.

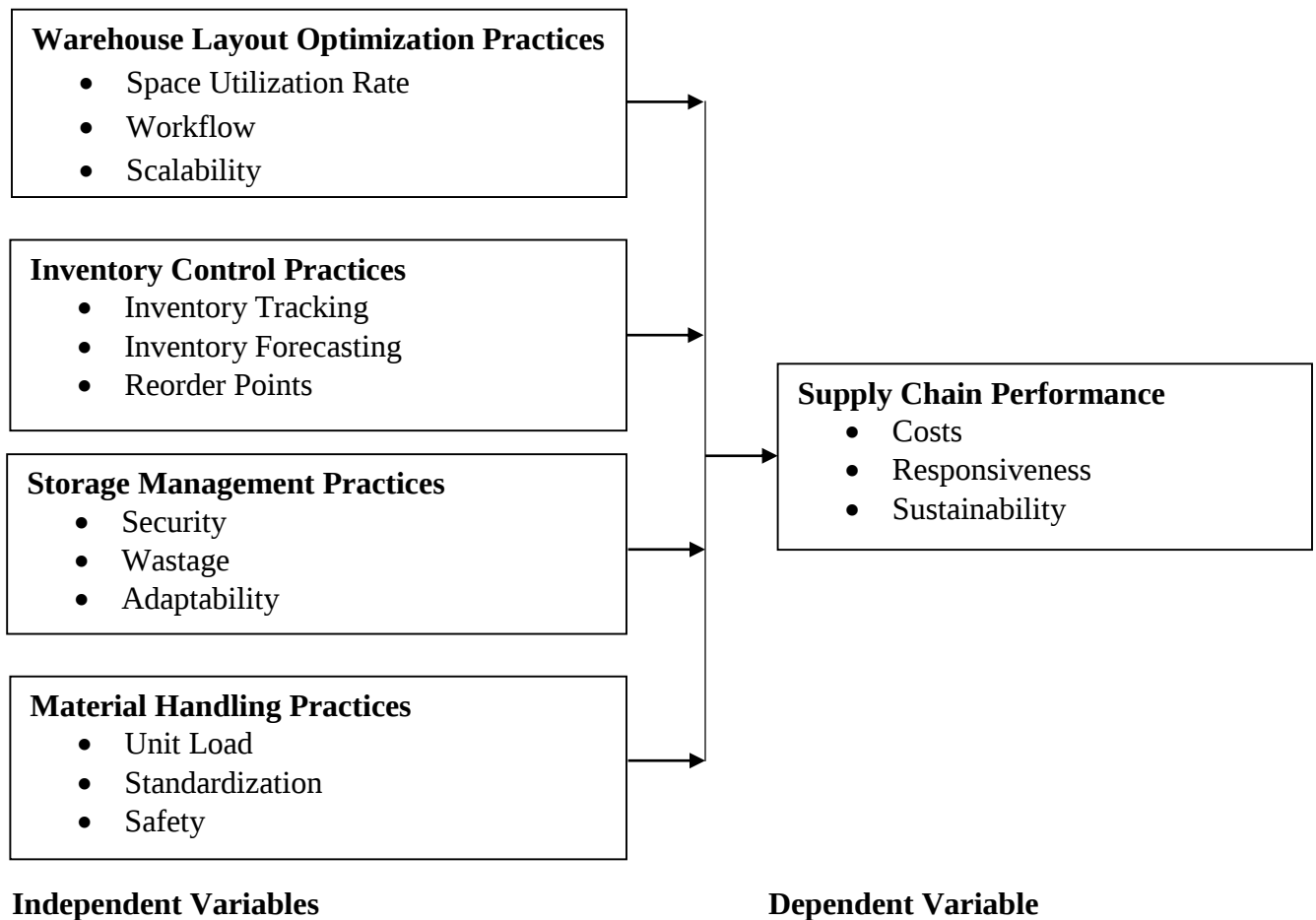


FIGURE 1Conceptual Framework

Source(Researcher,2025)

2.5 Operationalization of the Study Variables

Table 1 outlines the operationalization of the variables of the study showcasing the variables of the study, their respective indicators and measure.

TABLE 1
Operationalization Of The Variables

Variable Type	Variable	Indicators	Measurement Scale
Independent Variable	Warehouse Layout Optimization Practices	• Space Utilization Rate • Workflow • Scalability	Likert Scale
Independent Variable	Inventory Control Practices	• Inventory Tracking • Inventory Forecasting • Reorder Points	Likert Scale
Independent Variable	Storage Management Practices	• Security • Wastage • Adaptability	Likert Scale
Independent Variable	Material Handling Practices	• Unit Load • Standardization • Safety	Likert Scale
Dependent Variable	Supply Chain Performance	• Costs • Responsiveness • Sustainability	Likert Scale

2.6 Research Gaps

The empirical studies reviewed provide useful insights into the influence of warehousing management practices on supply chain performance across different contexts. However, a number of research gaps can be observed. On warehouse layout optimization, studies such as Mohamud et al. (2023), Ikegwuru and Chinyere (2020), and Kibet et al. (2024) confirmed that efficient warehouse layouts enhance performance, customer satisfaction, and operational efficiency. Nevertheless, the majority of these studies were either literature-based reviews or conducted in foreign contexts such as Nigeria. Even though Kibet et al. (2024) focused on Kenyan distribution companies, their study generalized warehouse structure without specifically contextualizing

agricultural firms. Similarly, Ngera (2014) emphasized third-party logistics providers but overlooked listed agricultural firms. This suggests a contextual gap, as there is limited empirical evidence linking warehouse layout optimization directly to the supply chain performance of agricultural firms in Kenya.

Yousfani et al. (2023), Atnafu et al. (2018), and Mwakima and Osoro (2024) established that inventory management strategies significantly improve competitiveness and supply chain performance. However, these studies were largely focused on hospitals in Pakistan, micro and small enterprises, and logistics companies in Nairobi, leaving little insight into inventory control in agricultural firms listed on the Nairobi Securities Exchange. Furthermore, some studies, such as Sugut and Ondara (2023), demonstrated mixed findings, with some inventory practices showing negligible impact on supply chain performance. This indicates both a methodological and conceptual gap, as there is need for sector-specific analysis to determine which inventory practices are most effective in agricultural supply chains.

Regarding storage management practices, existing studies by Kisinga et al. (2024), Odhiambo and Jaoko (2016), and Njoroge (2022) confirmed the significance of effective storage systems and cold-chain management in enhancing organisational and financial performance. Yet, these studies were mostly conducted in supermarkets, grape processing companies, or pharmaceutical firms, which differ substantially from agricultural firms in terms of product characteristics and storage requirements. This points to a contextual gap, as the effect of storage management on the supply chain performance of listed agricultural firms in Kenya remains underexplored.

On material handling practices, studies such as Tanveer et al. (2022), Chidebe (2023), and Kimathi and Wachiuri (2021) highlighted that material management significantly influences

organisational performance across diverse industries including textiles, pharmaceuticals, and dairy. However, findings are not entirely consistent. For instance, Chidebe (2023) reported that material planning strategies had no significant impact on net profit, suggesting the need for further research to clarify which aspects of material handling are most impactful. Locally, studies like Kisioya and Moronge (2019) showed positive results in Nairobi's manufacturing sector, but their scope excluded agricultural firms listed on the stock exchange. This presents a contextual since the unique handling requirements of agricultural produce dictated by perishability, bulkiness, and fragility have not been sufficiently addressed in the Kenyan context.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology that was used to conduct the current study. The chapter discusses the methods that were used in collecting data as well as analysis of the data for the sole purpose of answering the research questions. The chapter gives an explanation of the research design, targeted population, sampling techniques and methods used in data collection. Further, reliability and validity procedures that were applied in testing the research instrument are discussed.

3.2 Research Design

Creswell and Creswell (2018) define a research design as the strategy for addressing some of the difficulties faced during the study's process and obtaining answers to the topics under investigation. The study used a descriptive-correlational design. According to Kothari (2014) a descriptive-correlational design is perceived helpful when describing current state of variables within a population and analysing the type and strength of correlations between those variables without their manipulation. The descriptive element of the design allowed the researcher to record and display the most common warehouse management practices used by agricultural companies listed on the NSE. Furthermore, the correlational component disclosed predicted links between the independent and dependent variables by enabling the researcher to evaluate the degree to which these practices are linked to supply chain performance.

3.3 Target Population

According to Levy and Lemeshow (2011), a population is the entire set of people that the researcher wants to study. It is characterised by the elements' accessibility, the duration, the geographical limits, and the subject matter. This study targeted 7 NSE listed agricultural firms as listed in Appendix 3. The firms have been selected as they are key industry players whose warehousing management practices significantly influence supply chain performance and are subject to higher operational, regulatory, and reporting standards. The units of observation comprised of Warehouse Managers, Supply Chain Managers, Inventory Controllers and Operations Managers from each firm as outlined in table 2. The respondents are deemed appropriate for the study as they are directly responsible for implementing warehousing management practices and have practical insights into their impact on supply chain performance

TABLE 2
Target Population

Target Population	Population	Percentage
Warehouse Managers	28	25%
Supply Chain Managers	28	25%
Inventory Controllers	28	25%
Operations Managers	28	25%
Total	112	100%

3.4 Sample Size and Sampling Procedure

A sample is a subset of the population that accurately reflects the entire population being studied (Wang, 2024). According to Ali and Hatf (2024), sampling is the process of selecting a group of individuals from a population in order to gather data on the complete population. The study employed a census approach to include all the NSE listed agricultural firms. The census is justified by the fact that the firms are few in number. A purposive sampling approach was utilized in selecting the respondents of the study. The approach is justified by the fact that it ensures that only participants who are directly involved in warehousing operations and supply chain

management are included, thereby enhancing the validity and relevance of the findings (Turner, 2020). The units of observation comprised of 112 Warehouse Managers, Supply Chain Managers, Inventory Controllers and Operations Managers from each firm.

3.5 Research Instruments

Primary data was used for analysis in the study. Quantitative primary data was gathered using a standardised questionnaire containing closed-ended questions (Bloomfield & Fisher, 2019). The purpose of the study is to gather the opinions of operations managers, supply chain managers, warehouse managers, and inventory controllers regarding the warehousing management practices in the corresponding agricultural companies. The use of questionnaires in this study is justified by the fact that they are low-cost, require less effort from the questioner than telephone or verbal surveys, and often contain standardised replies that facilitate data collection.

3.6 Data Collection Procedures

Kabir (2016) define the data collecting procedure as the methods utilised to gather data after the research instrument has been created. The researcher acquired a data collection letter from KCA before proceeding to the field to collect data. A research permit was also sought from National Commission for Science, Technology, and Innovation (NACOSTI). In the questionnaire, an introduction letter was attached detailing what the study was all about and the level of confidentiality that the researcher observed in course of the study. The administration of the questionnaires were through drop and pick.

3.7 Pilot Test

A pilot study is a small-scale research conducted before the main study to test the validity, and reliability of the research design, instruments, and procedures (Kunselman, 2024). The study helps researchers identify potential problems, refine data collection tools estimate the time and

resources required, and ensure that the methods are appropriate for achieving the study objectives. The major areas of adjustments that pilot study sought to address was on whether the respondents understood the various aspects being addressed in the questionnaire. Revisions were made in the phrasing of the items in the questionnaire for better understanding by the respondents. Malmqvist et al (2019) recommended that between 5% and 10% of the target population should be used for piloting the research instruments. This study utilized 7% of the target population for piloting. This involved issuing 8 questionnaires (4 in each selected firm) two randomly selected agricultural firms that have not been listed in NSE. The firms comprised of Amiran Kenya Ltd and Keitt Exporters Ltd. The respondents in the pilot comprised of warehouse managers, supply chain managers, inventory controllers and operations managers.

3.7.1 Reliability of Research Instruments

Research instrument reliability is the extent to which a tool reliably yields consistent, steady, and trustworthy results when utilized in similar conditions (Saunders et al, 2016). If a study is conducted again with the same people and conditions, a reliable instrument produces the same results, indicating that there is no chance of random mistake in the measurement. The study evaluated the internal consistency of the questionnaire items using the Cronbach's Alpha coefficient. The reliability of the instrument is demonstrated by a Cronbach's Alpha score of 0.70 or higher, which is considered suitable for social science research. Questionnaire items having Cronbach's Alpha coefficients below 0.7 were either modified or eliminated entirely.

3.7.2 Validity of Research Instruments

Boateng (2018) defines validity as the extent to which an instrument or research tool measures what it is supposed to measure. A valid instrument ensures that the data collected reflects the variables being investigated and that the findings can be trusted and generalized. The study

assessed both face and construct validity. The researcher engaged the supervisor and supply chain management specialists to examine the questionnaire items and determine whether they are understandable and pertinent to the study's goals in order to ensure face validity. The comments was utilised by the researcher to improve the questionnaire's content. The researcher used component factor analysis for construct validity, setting a threshold of 0.5 for factor loading values. Questionnaire items with factor loading values below 0.5 were eliminated (Embretson & Gorin, 2016).

3.8 Data Analysis and Presentation

According to Alem (2020), data analysis entails the interpretation, organisation, and presentation of gathered data in order to make the information gathered from the field more useful. Once quantitative data has been collected, it was sorted and edited to eliminate any errors, repetitions, or inconsistencies that could complicate analysis. The data was analysed using both descriptive and inferential statistics using Microsoft Excel and the Statistical Package for Social Sciences (SPSS) version 26. Inferential statistics included regression and correlation, whereas descriptive statistics included mean and standard deviation. The following regression model was used in the study to evaluate the type of association between the independent and dependent variables.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \epsilon$$

Where:

Y represent supply chain performance of NSE listed agricultural firms

β_0 represent constant term

$\beta_1, \beta_2, \beta_3$ and β_4 represent unknown beta coefficients

X_1 represent warehouse layout optimization practices

X_2 represent inventory control practices

X_3 represent storage management practices

X_4 represent material handling practices

ε represent Error term

To ascertain the statistical association between the dependent and independent variables, the researcher evaluated the regression output's beta coefficient (whether positive or negative) and corresponding significant values (whether smaller than 0.05).

3.9 Ethical Considerations

Throughout the research process, the study adhered to ethical guidelines to protect participants and maintain the integrity of the results. Formal consent was acquired from the participating agricultural enterprises and approval from the appropriate research authorization agencies were sought prior to data collection. After being fully informed of the study's goals, the knowledge that participation is voluntary, and the flexibility to stop at any moment without paying any fees, each participant were also asked for their informed consent. Responses were treated with the highest confidentiality, and the identity of the participants were kept secret. The information gathered was kept safe to avoid unwanted access and used only for academic reasons. Anonymity was preserved by making sure that no respondent names or other identifying information is included in the results reporting.

CHAPTER FOUR

RESULTS AND DISCUSSION

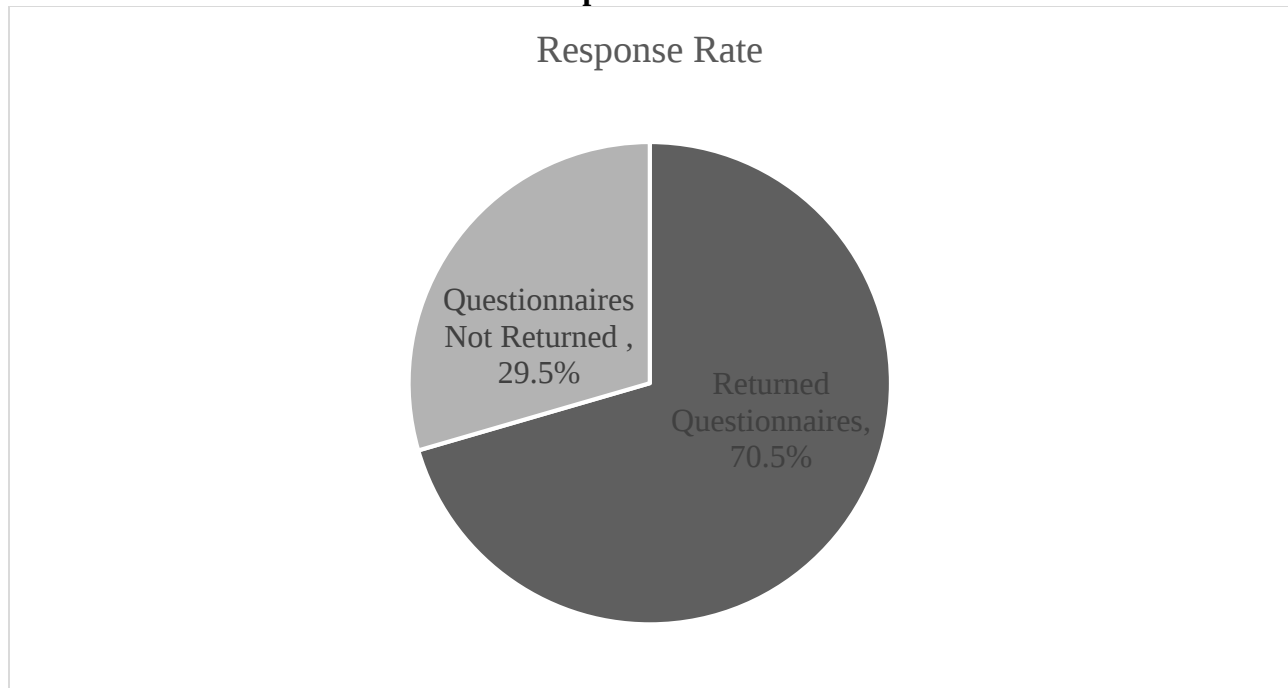
4.1 Introduction

The results of the study are presented in this chapter. The chapter specifically contains results the response rate, the pilot study, as well as the background information of the respondents. Additionally, the descriptive statistics comprising of means and standard deviations are also presented. The chapter further discusses the results from inferential statistics comprising of both correlation and regression analysis. The study utilized figures and tables in displaying the results.

4.2 Response Rate

The study assessed the response rate of the study to determine if the responses acquired from the issued questionnaires were viable for making inferences about the study. The researcher issued 112 questionnaires to the targeted population of the study comprising of warehouse managers, supply chain managers, inventory controllers and operations managers from the selected agricultural firms listed in NSE. Out of 112 questionnaires, 79 were fully filled and returned for analysis. This represented a response rate of 70.5%. The response rate according to Babbie (2018) was considered sufficient for analysis and for providing a basis for generalizing the study findings to the target population. The high response rate was as a result of application of drop and pick technique by the researcher during the data collection period which gave the respondents sufficient time to respond. Figure 2 displays the response rate results.

FIGURE 2
Response Rate



4.3 Pilot Test Results

The study conducted a pilot study prior data collection for the main study aiming at identifying potential problems, refine data collection tools and ensure that the methods were appropriate for achieving the study objectives. This study utilized 7% of the target population for piloting as recommended by Malmqvist et al (2019). This involved issuing 8 questionnaires (4 in each selected firm) to two randomly selected agricultural firms that were not listed in NSE. The firms comprised of Amiran Kenya Ltd and Keitt Exporters Ltd. The respondents in the pilot study comprised of warehouse managers, supply chain managers, inventory controllers and operations managers.

4.3.1 Reliability Test

The Cronbach's Alpha coefficient was used in the study to assess the questionnaire items' internal consistency. A Cronbach's Alpha value of 0.70 or higher was deemed appropriate for

social science research, demonstrating the instrument's reliability. Items with Cronbach's Alpha coefficient of less than 0.7 calls for adjustment or complete removal from the questionnaire. According to the reliability results outlined in table 3, the Cronbach value for 6 items assessing warehouse layout optimization practices, 7 items assessing inventory control practices, 6 items assessing storage management practices, 7 items assessing material handling practices and 7 assessing supply chain performance was above 0.7. This bear the implications that the items were reliable in assessing respective aspects of the variable.

TABLE 3
Reliability Test Results

Variables	Cronbach's Alpha	Number of Items	Conclusion
Warehouse Layout Optimization Practices	0.910	6	Reliable
Inventory Control Practices	0.975	7	Reliable
Storage Management Practices	0.939	6	Reliable
Material Handling Practices	0.923	7	Reliable
Supply Chain Performance	0.820	7	Reliable

4.3.2 Validity Test Results

The study assessed both face and construct validity. The researcher engaged the supervisor and supply chain management specialists to examine the questionnaire items and determine whether they were understandable and pertinent to the study's goals in order to ensure face validity. The comments was then used by the researcher to improve the questionnaire's content. The researcher used Component Factor Analysis, setting a threshold of 0.5 for factor loading value in order to ensure construct validity. The questionnaire had to be cleared of items with factor loading values below 0.5 (Embretson & Gorin, 2016). According to the results outlined in table 4, all items had factor loading values of above 0.5 implying that the items were valid and measured what they purported to measure. Thus, no item was removed from the questionnaire.

TABLE 4
Factor Loading Values

Warehouse Layout Optimization	Factor Loading Values
The warehouse layout allows for maximum use of available storage space	0.78
Storage areas are organized to minimize unused or wasted space	0.72
The arrangement of storage and work areas promotes smooth and efficient workflow	0.69
The current layout reduces congestion during peak operations	0.65
The warehouse layout can easily accommodate an increase in inventory volume	0.74
The design of the warehouse allows for flexible reconfiguration when operational needs change	0.58
Inventory Control Practices	Factor Loading Values
The firm maintains accurate records of all inventory items at all times	0.82
Inventory discrepancies are promptly identified and corrected	0.75
The firm uses historical data to predict future inventory needs accurately	0.78
Inventory forecasts are reviewed regularly to accommodate seasonal variations	0.8
The firm has clearly defined reorder levels for all critical inventory items	0.77
Reorder points are regularly reviewed and adjusted based on demand fluctuations	0.74
The firm replenishes inventory promptly when reorder points are reached	0.83
Storage Management Practices	Factor Loading Values
The storage facilities in the firm are well-protected against theft and unauthorized access	0.78
Our firm implements strict access control measures to safeguard stored agricultural products	0.81
Our storage practices minimize product spoilage	0.74
Proper handling and storage procedures are in place to reduce wastage	0.76
Our storage facilities can easily accommodate changes in the type and volume of products stored	0.80
The storage facilities are flexible enough to adapt to seasonal inventory fluctuations	0.71
Material Handling Practices	Factor Loading Values
The firm groups materials into unit loads to facilitate movement and storage	0.65

Proper unit load design is applied to minimize handling time	0.62
Standardized equipment and containers are used for material handling throughout the warehouse	0.60
Standard procedures are applied when handling all types of materials to ensure consistency	0.58
Employees are trained to follow standardized handling methods to reduce errors	0.88
Safety guidelines are strictly followed during material handling in the warehouse	0.90
Proper handling equipment is provided to ensure the safety of staff and materials	0.87
Supply Chain Performance	Factor Loading Values
Our firm effectively minimizes operational costs in warehousing and distribution	0.62
We consistently achieve cost savings through improved supply chain practices	0.74
Our supply chain can quickly respond to changes in customer demand	0.69
Orders are processed and delivered to customers in a timely manner	0.78
We have systems in place to quickly resolve supply chain disruptions	0.71
Our supply chain maintains consistent performance even during market fluctuations	0.76
The firm ensures continuity of supply to meet customer demands over the long term	0.65

4.4 Background Information of Respondents

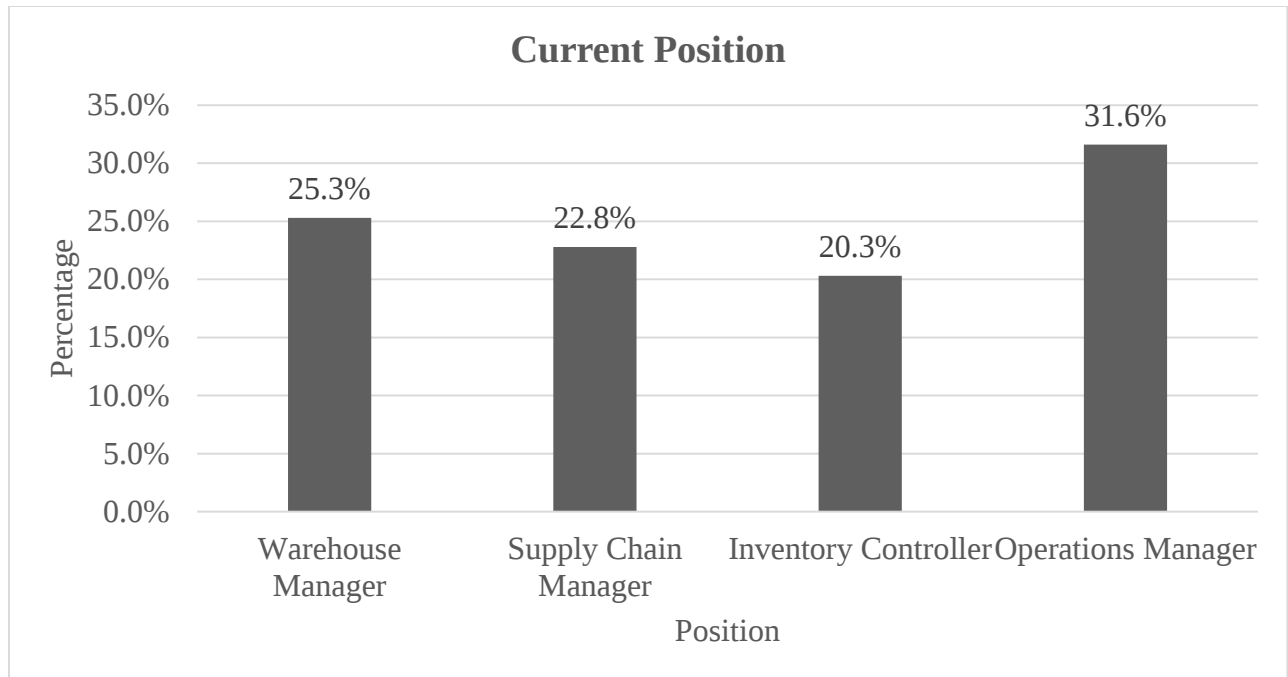
The background information of respondents involved in the study comprised of position, work experience and highest level of education.

4.4.1 Position

The results on the position occupied by the respondents in their respective agricultural firms as presented in figure 3 shows that warehouse managers were 25.3%, supply chain managers were 22.8%, inventory controllers were 20.3% while operations managers accounted for 31.6%. The results shows that all the targeted respondents were well represented in the study. This provided grounds for achieving different perspectives regarding how the various warehousing management practices influenced supply chain performance of the firms.

FIGURE 3

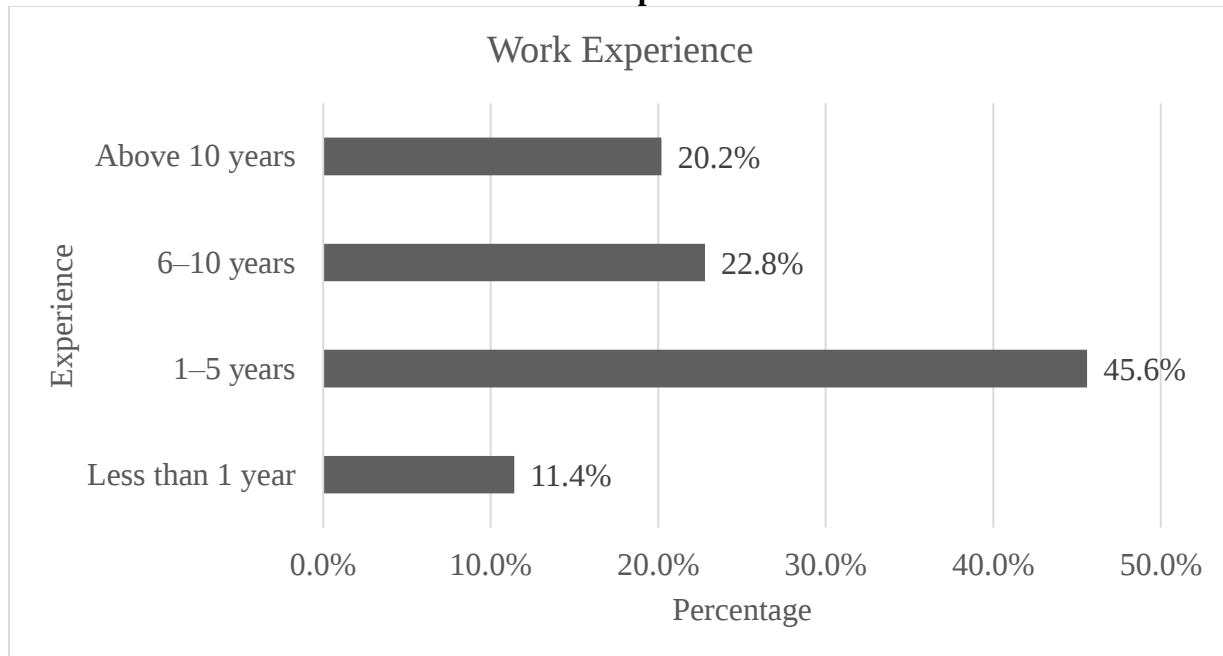
Position



4.4.2 Work Experience

The results on the respondents' experience at work presented in figure 4 shows that those with less than 1 year experience level were 11.4%, between 1 year and 5 years were 45.6%, between 6 years and 10 years were 22.8% and above 10 years were 20.2%. Majority of the respondents according to the results had an experience of more than one year. The results implied that the study realized credible findings since the responses were informed by individuals with sufficient exposure to the operational environment of agricultural firms in terms of the various warehousing management practices adopted and respective impact on supply chain operations.

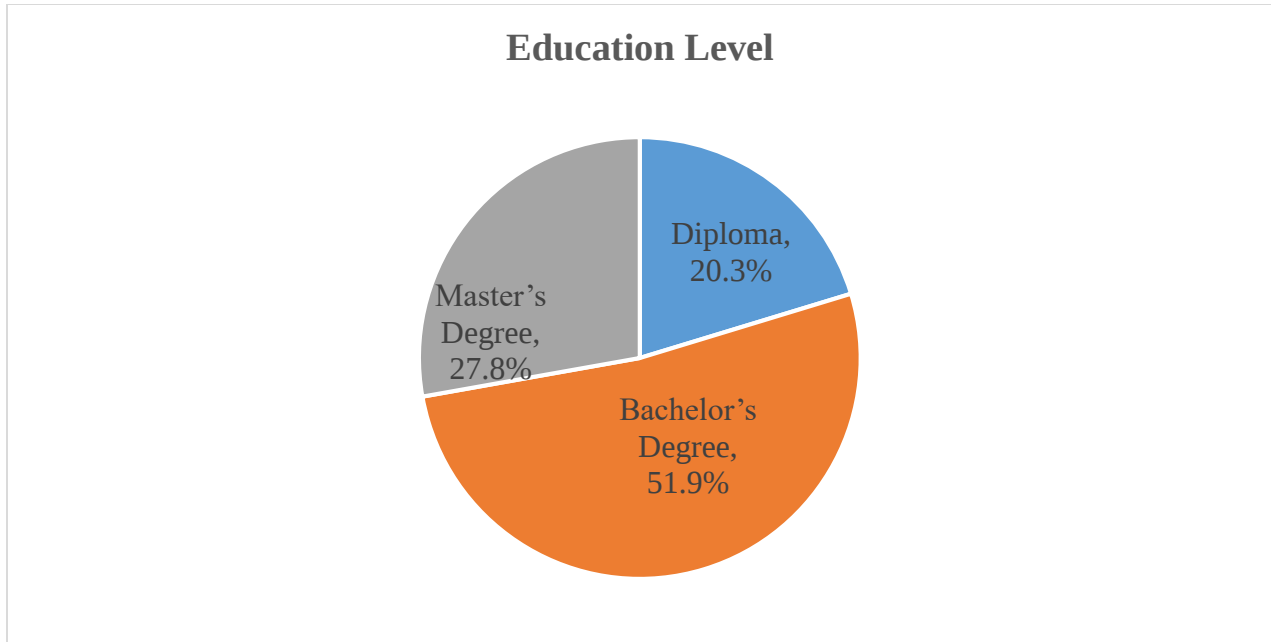
FIGURE 4
Work Experience



4.4.3 Highest Level of Education

The results on the respondents' highest education level presented in figure 5 shows that those with diploma academic level were 20.3%, those with bachelor's degree were 51.9% while those with master's degree were 27.8%. Majority of the respondents according to the results were both degree and master degree holders. The results bear the implications that the respondents involved in the study possessed requisite knowledge and skills to understand the different warehousing management practices applied by the firms and how they impact on the supply chain performance.

FIGURE 5
Education Level



4.5 Descriptive Statistics

4.5.1 Warehouse Layout Optimization Practices

The first objective of the study sought to establish the influence of warehouse layout optimization practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study provided the respondents with various statements on warehouse layout optimization practices and requested them to indicate their level of agreement with the statements. The rating was based on a 5-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. According to the results presented in table 5, respondents concurred with the statements that the warehouse layout allowed for maximum use of available storage space (mean=3.810), that storage areas were organized to minimize unused or wasted space (mean=3.570) and that the arrangement of storage and work areas promoted smooth and efficient workflow (mean=3.582).

The results additionally revealed that respondents agreed with the statements that the warehouse layout can easily accommodate an increase in inventory volume (mean=3.658) and that the design of the warehouse allowed for flexible reconfiguration when operational needs change (mean=3.608). Respondents however were neutral with the statements that the current layout reduced congestion during peak operations (mean=3.418). The overall score on the statements on warehouse layout optimization was 3.608 and a subsequent standard deviation of 1.475. This bears the implication that respondents agreed with the statements on overall. The results concur with Ikegwuru and Chinyere (2020) who noted that an optimized layout reduces the time and effort required to locate, pick, and move goods, thereby minimizing delays in order fulfillment.

TABLE 5
Descriptive Results On Warehouse Layout Optimization Practices

Warehouse Layout Optimization	N	Mean	Std.Dev
The warehouse layout allows for maximum use of available storage space	79	3.810	1.378
Storage areas are organized to minimize unused or wasted space	79	3.570	1.508
The arrangement of storage and work areas promotes smooth and efficient workflow	79	3.582	1.598
The current layout reduces congestion during peak operations	79	3.418	1.646
The warehouse layout can easily accommodate an increase in inventory volume	79	3.658	1.484
The design of the warehouse allows for flexible reconfiguration when operational needs change	79	3.608	1.234
Overall Score	79	3.608	1.475

4.5.2 Inventory Control Practices

The second objective of the study sought to establish the influence of inventory control practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study provided the respondents with various statements on inventory control practices and requested them to indicate their level of agreement with the statements. The rating was based on a 5-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree

and 5=Strongly Agree. According to the results presented in table 6, respondents agreed with the statements that the firm maintained accurate records of all inventory items at all times (mean=3.506) and that inventory forecasts were reviewed regularly to accommodate seasonal variations (mean=3.532). Respondents however had a neutral perception on the statements that inventory discrepancies were promptly identified and corrected (mean=3.063), that the firm used historical data to predict future inventory needs accurately (mean=3.038) and that the firm had clearly defined reorder levels for all critical inventory items (mean=3.114). Consequently, respondents neither agreed nor disagreed with the statements that reorder points were regularly reviewed and adjusted based on demand fluctuations (mean=3.013) and that the firm replenished inventory promptly when reorder points are reached (mean=3.063). The overall score for the statements on inventory control practices was 3.190 and a standard deviation of 1.517 implying a general neutrality with the statements. According to Atnafu et al., (2018), accurate inventory control is crucial in managing the challenges of perishability and demand volatility in agricultural firms.

TABLE 6
Descriptive Results On Inventory Control Practices

Inventory Control Practices	N	Mean	Std.Dev
The firm maintains accurate records of all inventory items at all times	79	3.506	1.568
Inventory discrepancies are promptly identified and corrected	79	3.063	1.522
The firm uses historical data to predict future inventory needs accurately	79	3.038	1.489
Inventory forecasts are reviewed regularly to accommodate seasonal variations	79	3.532	1.492
The firm has clearly defined reorder levels for all critical inventory items	79	3.114	1.577
Reorder points are regularly reviewed and adjusted based on demand fluctuations	79	3.013	1.515
The firm replenishes inventory promptly when reorder points are reached	79	3.063	1.453
Overall Score	79	3.190	1.517

4.5.3 Storage Management Practices

The third objective of the study sought to establish the influence of storage management practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study provided the respondents with various statements on storage management practices and requested them to indicate their level of agreement with the statements. The rating was based on a 5-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. According to the results presented in table 7, respondents were in agreement with the statements that the storage facilities in the firm were well-protected against theft and unauthorized access (mean= 3.519) and the fact that their firms implemented strict access control measures to safeguard stored agricultural products (mean= 3.506).

Respondents however had neutral responses with the sentiments that their storage practices minimized product spoilage (mean=2.987), that proper handling and storage procedures were in place to reduce wastage (mean=2.570) as well as the fact that their storage facilities can easily accommodate changes in the type and volume of products stored (mean=2.684). There was further neutral response on the statement that the storage facilities were flexible enough to adapt to seasonal inventory fluctuations (mean= 2.658). The overall score for the statements on storage management practices was 2.987 and a respective standard deviation of 1.550. This had an implication that there was a general neutral response amongst respondents on the various aspects of storage management practices. The results tallies with sentiments by Njoroge (2022) who noted that proper storage practices should aim at minimizing spoilage, contamination, and product deterioration, thereby safeguarding the firm's reputation while enhancing overall supply chain performance.

TABLE 7
Descriptive Results On Storage Management Practices

Storage Management Practices	N	Mean	Std.Dev
The storage facilities in the firm are well-protected against theft and unauthorized access	79	3.519	1.592
Our firm implements strict access control measures to safeguard stored agricultural products	79	3.506	1.640
Our storage practices minimize product spoilage	79	2.987	1.645
Proper handling and storage procedures are in place to reduce wastage	79	2.570	1.550
Our storage facilities can easily accommodate changes in the type and volume of products stored	79	2.684	1.490
The storage facilities are flexible enough to adapt to seasonal inventory fluctuations	79	2.658	1.386
Overall Score	79	2.987	1.550

4.5.4 Material Handling Practices

The fourth objective of the study sought to establish the influence of material handling practices on supply chain performance of agricultural firms listed in Nairobi Securities Exchange in Kenya. The study provided the respondents with various statements on material handling practices and requested them to indicate their level of agreement with the statements. The rating was based on a 5-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. According to the results presented in table 8, respondents were in agreement with the statements that employees were trained to follow standardized handling methods to reduce errors (mean=3.519), that safety guidelines were strictly followed during material handling in the warehouse (mean=3.519) and that proper handling equipment was provided to ensure the safety of staff and materials (mean=3.532).

Respondents however neither agreed nor disagreed with the statements that the firms grouped materials into unit loads to facilitate movement and storage (mean=2.582), and that proper unit load design was applied to minimize handling time (mean=2.620). Remarkably, there was

neutral responses amongst respondents on the fact that standardized equipment and containers were used for material handling throughout the warehouse (mean=2.658) and that standard procedures were applied when handling all types of materials to ensure consistency (mean=2.658). An overall score of 3.013 and a standard deviation of 1.507 implied that the respondents had a neutral response with the statements regarding material handling practices. The results concurs with Kimathi and Wachiuri (2021) who noted that in agricultural firms, material handling practices must be designed with the fragility and perishability of products in mind, ensuring that items are transported gently and quickly to preserve quality.

TABLE 8
Descriptive Statistic Results On Material Handling Practices

Material Handling Practices	N	Mean	Std.Dev
The firm groups materials into unit loads to facilitate movement and storage	79	2.582	1.364
Proper unit load design is applied to minimize handling time	79	2.620	1.435
Standardized equipment and containers are used for material handling throughout the warehouse	79	2.658	1.493
Standard procedures are applied when handling all types of materials to ensure consistency	79	2.658	1.501
Employees are trained to follow standardized handling methods to reduce errors	79	3.519	1.600
Safety guidelines are strictly followed during material handling in the warehouse	79	3.519	1.648
Proper handling equipment is provided to ensure the safety of staff and materials	79	3.532	1.509
Overall Score	79	3.013	1.507

4.5.5 Supply Chain Performance

The study provided the respondents with various statements on supply chain performance and requested them to indicate their level of agreement with the statements. The rating was based on a 5-point Likert scale where 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree. According to the results presented in table 9, respondents agreed with the

statements that their firms effectively minimized operational costs in warehousing and distribution (mean=3.608), and that the firms consistently achieve cost savings through improved supply chain practices (mean=3.684). Similarly, there was consensus on the fact that orders were processed and delivered to customers in a timely manner (mean=3.544) and the fact that the firms ensured continuity of supply to meet customer demands over the long term (mean=3.557).

Respondents however had neutral responses with the statements that their supply chain could quickly respond to changes in customer demand (mean=3.139), that they had systems in place to quickly resolve supply chain disruptions (mean=3.241) as well as the fact their supply chain maintained consistent performance even during market fluctuations (mean =3.063). The overall score on the statements on supply chain performance was however 3.405 and a standard deviation value of 1.222 was implying that the respondents had neutral perception with the statements. According to Osoro (2024), an effective supply chain performance in the firms ensures that products reach markets in good condition, within the required timelines, and at an optimal cost, thus enhancing competitiveness and profitability.

TABLE 9
Descriptive Statistic Results On Supply Chain Performance

Supply Chain Performance	N	Mean	Std.Dev
Our firm effectively minimizes operational costs in warehousing and distribution	79	3.608	1.363
We consistently achieve cost savings through improved supply chain practices	79	3.684	1.246
Our supply chain can quickly respond to changes in customer demand	79	3.139	1.347
Orders are processed and delivered to customers in a timely manner	79	3.544	1.299
We have systems in place to quickly resolve supply chain disruptions	79	3.241	1.222
Our supply chain maintains consistent performance even during market fluctuations	79	3.063	0.952
The firm ensures continuity of supply to meet customer demands over the long term	79	3.557	1.129
Overall Score	79	3.405	1.222

4.6 Inferential Statistics

4.6.1 Correlation Analysis

Table 10 presents the results on the correlation analysis results of the study. The findings showed a favourable and significant correlation between supply chain performance and warehouse layout optimisation techniques for Kenyan agricultural companies listed on the NSE. A p-value of 0.001 and a Pearson Correlation value of 0.354 demonstrate this. The findings suggest that improving warehouse layout optimisation techniques raises supply chain performance levels for agricultural companies. The findings support those of Mohamud et al. (2023), who found that effective warehouse operations and layout had a favourable impact on total warehouse performance, indicating that both operational procedures and structural design are essential for increasing efficiency.

The findings also showed a strong and significant correlation between supply chain performance and inventory management procedures for Kenyan agricultural companies listed on the NSE. A p-value of 0.000 and a Pearson Correlation value of 0.639 demonstrate this. The findings suggest that improving inventory control procedures raises supply chain performance levels for agricultural companies. The outcomes are consistent with research by Yousfani et al. (2023), which demonstrated that inventory control procedures had a favourable effect on supply chain efficiency.

The findings also demonstrated a positive and significant correlation between supply chain performance and storage management techniques for Kenyan agricultural companies listed on the NSE. This is shown by a Pearson Correlation value of 0.544 and a p-value of 0.000. The results bear the implications that when storage management practices are enhanced, it leads to enhanced

levels of supply chain performance amongst the agricultural firms. According to Odhiambo and Jaoko (2016), firms that employ a mix of automated storage, random access storage, closed storage, and open storage systems experiences reduced product loss and improved operational efficiency.

The findings also demonstrated a positive and significant correlation between supply chain performance and material handling procedures for Kenyan agricultural companies listed on the NSE. A p-value of 0.049 and a Pearson Correlation value of 0.229 demonstrate this. The findings suggest that improved material handling procedures result in higher supply chain performance levels among agricultural companies. The results match with the findings from Kimathi and Wachiuri (2021) who established existence of a significant and positive correlation between sustainable material handling practices, such as coordinated internal transport, ergonomic handling systems, and efficient storage-to-production flow, and organizational performance.

TABLE 10
Correlation Results

		Warehouse Layout Optimizatio n Practices	Inventor y Control Practices	Storage Managemen t Practices	Material Handling Practices	Supply Chain Performanc e
Warehouse Layout Optimizatio n Practices	Pearson Correlatio n Sig.(2- tailed)	1				
Inventory Control Practices	Pearson Correlatio n Sig.(2- tailed)	.022 .847	1			
Storage Management Practices	Pearson Correlatio n Sig.(2- tailed)	.192 .090	.407 .000	1		
Material Handling Practices	Pearson Correlatio n Sig.(2- tailed)	-.133 .243	-.079 .489	-.309 .006	1	
Supply Chain Performance	Pearson Correlatio n Sig.(2- tailed)	.354 .001	.639 .000	.544 .000	.229 .042	1
	N	79	79	79	79	79

4.6.2 Regression Analysis

The incorporation of the regression analysis in the study was aimed at establishing existence of relationships between the independent and dependent variables. The analysis was conducted at 95% confidence level. The output of the analysis comprised of Model Summary, Analysis of Variance and Regression Coefficients.

The Model Summary results sought to assess the extent to which the independent variables (warehouse layout optimization practices, inventory control practices, storage management

practices and material handling practices) related with supply chain performance, the dependent variable. The findings also aimed to evaluate the proportion of the dependent variable that was explained by the joint independent factors. According to the results shown in Table 11, there is a substantial association between the independent and dependent variables, as indicated by the R-value of 0.871. The coefficient of determination, or R-squared, was 0.759, meaning that 75.9% of the variances in the supply chain performance of Keya's NSE-listed agricultural companies can be accounted by warehouse layout optimization practices, inventory control practices, storage management practices and material handling practices.

TABLE 11
Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.871 ^a	.759	.746	.249
a. Predictors: (Constant), Warehouse Layout Optimization Practices, Inventory Control Practices, Storage Management Practices and Material Handling Practices			

The findings of the analysis of variance (ANOVA) were used in the study to determine the statistical significance of the model that connected the independent and dependent variables. The p-value was 0.000, which was below the 0.05 significant level used in the study, based on the results shown in table 12. This suggested that the model's ability to evaluate the relationship between the independent and dependent variables was statistically significant.

TABLE 12**Anova**

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	14.447	4	3.612	58.217	0.000 ^b
	Residual	4.591	74	0.062		
	Total	19.038	78			
a. Supply Chain Performance						
b. Predictors: (Constant), Warehouse Layout Optimization Practices, Inventory Control Practices, Storage Management Practices and Material Handling Practices						

The regression coefficient output was incorporated in the study to help in answering the research questions formulated in the study. This was through assessing whether an independent variable has a positive/negative influence on the dependent variable and whether the influence was significant or insignificant. The results shown in Table 13 indicate that warehouse layout optimisation techniques have a positive and significant impact on the supply chain of Kenyan agricultural companies that are listed on the NSE. A substantial p-value of 0.000 and a positive beta value of 0.131 demonstrate this. The findings suggest that a one-unit increase in warehouse layout optimisation techniques leads to a 0.131-unit improvement in the supply chain efficiency of agricultural companies listed on the NSE. The findings support claims made by Mohamud et al. (2023), who found that effective warehouse operations and layout have a favourable impact on total warehouse performance, indicating that both operational procedures and structural design are essential for increasing efficiency.

The findings also showed that inventory control procedures have a favourable and significant impact on the supply chain performance of Kenyan agricultural companies that are listed on the NSE. A substantial p-value of 0.000 and a positive beta value of 0.178 demonstrate this. The findings suggest that a one-unit increase in inventory control procedures leads to a 0.178-

unit improvement in the supply chain performance of agricultural companies listed on the NSE. The findings support the findings of Atnafu et al. (2018), who found that competitiveness is increased by efficient inventory management, and that competitiveness leads to improved organisational performance.

The findings also demonstrated that the supply chain performance of Kenyan agricultural companies listed on the NSE is favourably and significantly impacted by storage management methods. This is demonstrated by the significant p-value of 0.000 and the positive beta value of 0.152. The findings suggest that a one-unit increase in storage management techniques leads to a 0.152-unit improvement in the supply chain performance of agricultural companies listed on the NSE. Odhiambo and Jaoko (2016) found that businesses that use a combination of automated storage, randomised storage, closed storage, and open storage systems have lower product loss and higher operational efficiency. These results are consistent with those of their study.

According to the regression analysis, material handling procedures have a favourable and significant impact on the supply chain performance of Kenyan agricultural companies that are listed on the NSE. A substantial p-value of 0.000 and a positive beta value of 0.165 demonstrate this. The findings suggest that a one-unit increase in material handling procedures leads to a 0.165-unit improvement in the supply chain performance of agricultural companies listed on the NSE. Kimathi and Wachiuri (2021) claim that ergonomic handling systems, effective storage-to-production flow, and coordinated internal transport are examples of sustainable material handling techniques that have a favourable impact on supply chain operational efficiencies that translate into organisational success.

TABLE 13
Regression Coefficients

Predictors	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.412	.144		9.784	.000
Warehouse Layout Optimization Practices	.131	.024	.322	5.505	.000
Inventory Control Practices	.178	.022	.497	7.929	.000
Storage Management Practices	.152	.024	.417	6.259	.000
Material Handling Practices	.165	.023	.440	7.296	.000

a. Dependent Variable: Supply Chain Performance

The initial regression model of the study was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Where:

Y represent supply chain performance of NSE listed agricultural firms

β_0 represent constant term

β_1 , β_2 , β_3 and β_4 represent unknown beta coefficients

X_1 represent warehouse layout optimization practices

X_2 represent inventory control practices

X_3 represent storage management practices

X_4 represent material handling practices

ε represent Error term

The optimal model of the study becomes:

Supply Chain Performance of NSE Listed Agricultural Firms = 1.412 + 0.178 (Inventory Control Practices) + 0.165 (Material Handling Practices) + 0.152 (Storage Management Practices) + 0.131 (Warehouse Layout Optimization Practices)

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter outlines the summary of the results derived from descriptive, correlation and regression analysis. The chapter further provides conclusions that can be drawn from the results as well as the recommendations. Areas of further studies are further presented in the chapter.

5.2 Summary

The study's main goal was to determine how warehouse management techniques affected the supply chain performance of Kenyan agricultural companies listed on the Nairobi Securities Exchange. The particular goals included determining how supply chain performance is impacted by inventory control, storage management, material handling, and warehouse layout optimisation techniques. The study focused on agricultural companies that were listed on the NSE, and the units of observation were operations managers, supply chain managers, warehouse managers, and inventory controllers. Data was gathered using structured questionnaires, and both descriptive and inferential statistics were used for quantitative analysis. Tables and figures were used to display the analysis's results.

5.2.1 Warehouse Layout Optimization Practices and Supply Chain Performance

The study sought to establish the influence of warehouse layout optimization practices on supply chain performance of agricultural firms listed in the Nairobi Securities Exchange. Descriptive results indicated that respondents generally agreed that their warehouse layouts maximized available storage space, promoted efficient workflow, accommodated increased inventory, and allowed for flexible reconfiguration when operational needs changed. However,

they were neutral on whether the layout reduced congestion during peak operations. Overall, the findings suggest that warehouse layout optimization practices were positively perceived by respondents as contributing to improved efficiency in warehouse operations, aligning with the view of Ikegwuru and Chinyere (2020) that optimized layouts enhance order fulfillment efficiency.

The correlation and regression results further revealed that warehouse layout optimization practices have a positive and significant influence on supply chain performance. This indicates that improvements in layout design and organization contribute to better overall supply chain outcomes, with enhanced efficiency and responsiveness to operational changes. These findings affirm the argument by Mohamud et al. (2023) that efficient warehouse layout and operations are critical drivers of warehouse and supply chain performance, as they ensure streamlined processes and improved productivity.

5.2.2 Inventory Control Practices and Supply Chain Performance

The study sought to establish the influence of inventory control practices on supply chain performance of agricultural firms listed in the Nairobi Securities Exchange. The descriptive results revealed that firms demonstrated moderate application of inventory control practices such as maintaining accurate records and reviewing inventory forecasts to accommodate seasonal variations. However, respondents remained neutral on aspects such as prompt correction of inventory discrepancies, use of historical data for forecasting, and setting and reviewing of reorder levels. This indicates that while certain inventory practices were in place, critical aspects of proactive inventory management were not consistently applied. According to Atnafu et al. (2018), accurate inventory management is essential in dealing with perishability and demand fluctuations in agricultural firms, highlighting the importance of strengthening such practices.

The correlation results established a positive and significant relationship between inventory control practices and supply chain performance, implying that improvement in inventory management enhances overall supply chain outcomes. Similarly, the regression analysis confirmed that inventory control practices significantly contribute to better supply chain performance, with improvements in inventory practices leading to measurable gains in efficiency and effectiveness. These findings align with Yousfani et al. (2023), who emphasized that effective inventory control is a critical driver of supply chain performance, underscoring its role in enhancing competitiveness and operational success.

5.2.3 Storage Management Practices and Supply Chain Performance

The descriptive results indicated that respondents generally held neutral views on most aspects of storage management practices in agricultural firms listed in the Nairobi Securities Exchange. While respondents agreed that storage facilities were well-protected and access controls were in place, they expressed neutrality regarding the ability of storage practices to minimize spoilage, reduce wastage, or adapt to fluctuations in inventory levels. This suggests that although measures for security are in place, efficiency and flexibility in storage management remain areas of concern. These findings align with Njoroge (2022), who emphasized that effective storage practices should not only ensure security but also minimize spoilage and enhance overall supply chain performance.

The inferential results revealed a significant and positive relationship between storage management practices and supply chain performance among agricultural firms. Correlation analysis showed that improvements in storage management are associated with enhanced supply chain performance, while regression results confirmed that strengthening these practices directly contributes to performance gains. This underscores the importance of efficient storage systems in

reducing product losses and improving operational efficiency. These findings are consistent with Odhiambo and Jaoko (2016), who observed that firms adopting advanced and diversified storage systems achieve reduced losses and improved efficiency in their supply chains.

5.2.3 Material Handling Practices and Supply Chain Performance

The descriptive findings revealed that agricultural firms listed in the Nairobi Securities Exchange have put some emphasis on material handling practices, particularly in areas such as employee training on standardized handling methods, adherence to safety guidelines, and provision of appropriate handling equipment to safeguard staff and materials. However, the responses remained neutral regarding practices such as grouping materials into unit loads, designing proper unit loads to minimize handling time, and using standardized equipment and procedures across the warehouse. This indicates that while some elements of material handling are practiced, consistency in applying standardized processes remains limited. These findings align with Kimathi and Wachiuri (2021), who emphasized that effective material handling practices must be tailored to the fragility and perishability of agricultural products to maintain their quality.

Further analysis established that material handling practices are positively associated with supply chain performance among the firms. Correlation analysis showed that strengthening handling practices enhances performance, while regression results confirmed a significant positive influence of material handling on supply chain outcomes. This means that improving practices such as internal transport coordination and efficient handling systems directly contributes to supply chain efficiency and overall organizational performance. These results are consistent with Kimathi and Wachiuri (2021), who found that sustainable material handling practices significantly boost operational efficiency and organizational outcomes.

5.3 Conclusions

5.3.1 Warehouse Layout Optimization Practices

The study concluded that warehouse layout optimization practices significantly enhance supply chain performance among agricultural firms listed in the Nairobi Securities Exchange. The findings indicate that well-structured layouts that maximize space utilization, improve workflow, and allow flexibility in reconfiguration contribute to greater efficiency and responsiveness in warehouse operations. Although reducing congestion during peak periods remained uncertain, the overall results demonstrate that optimized warehouse layouts are critical in supporting smooth processes, improving order fulfillment, and boosting overall supply chain efficiency.

5.3.2 Inventory Control Practices

The study concluded that while agricultural firms apply some level of record accuracy and seasonal forecasting, there are gaps in proactive management such as correcting discrepancies promptly and consistently reviewing reorder levels. Despite these gaps, the analysis established that effective inventory control significantly contributes to improved supply chain performance. The results highlight that strengthening inventory management practices leads to higher efficiency, reduces the risks associated with perishability and demand fluctuations, and ultimately improves competitiveness within the sector.

5.3.3 Storage Management Practices

The conclusions drawn on storage management practices show that although security measures and access controls are in place within agricultural firms, efficiency in minimizing spoilage, reducing wastage, and adapting to fluctuating inventory levels remains limited. Despite this, the study confirmed that storage management practices have a significant positive effect on supply chain performance. This demonstrates that investing in improved storage systems not only

reduces product losses but also enhances operational efficiency and overall supply chain outcomes, pointing to a need for firms to adopt more flexible and efficient storage practices.

5.3.4 Material Handling Practices

The study concluded that material handling practices positively influence supply chain performance among agricultural firms, with strengths observed in employee training, safety adherence, and provision of handling equipment. However, inconsistencies remain in the adoption of standardized handling methods, such as the design of proper unit loads and uniform equipment use. Despite these limitations, the results confirmed that improvements in material handling directly enhance efficiency, safeguard product quality, and support better organizational outcomes, underscoring the importance of consistent and efficient handling systems in supply chain performance.

5.4 Recommendations of the Study

The study provides recommendations to the management of agricultural firms listed in the Nairobi Securities Exchange to prioritize continuous improvement in warehouse layout optimization. Firms should invest in modern layout designs that not only maximize space utilization and improve workflow but also provide flexibility to reconfigure operations in response to fluctuating business needs. Additionally, deliberate efforts should be made to address congestion during peak periods by adopting technology-driven layout planning tools and efficient traffic flow systems. Such measures strengthen efficiency in warehouse operations and enhance overall supply chain performance.

The study provides recommendations to the management of agricultural firms to strengthen their inventory control practices by adopting more proactive and systematic approaches. This includes ensuring timely correction of discrepancies, regular review of reorder levels, and

increased use of historical and real-time data to forecast demand more accurately. The adoption of advanced inventory management systems and technologies, such as automated tracking and forecasting software, should be encouraged to improve visibility and accuracy. These improvements enhance efficiency in managing perishability and demand fluctuations, resulting in stronger supply chain performance.

The study provides recommendations to the management of agricultural firms to enhance storage management practices beyond security and access control measures. Firms should implement systems and technologies that help minimize spoilage, reduce wastage, and improve adaptability to fluctuating inventory levels. This could include investment in temperature-controlled storage facilities, use of smart monitoring tools, and adoption of flexible racking systems. By focusing on efficiency and adaptability in storage management, agricultural firms can significantly reduce product losses and achieve greater supply chain efficiency.

The study provides recommendations to the management of agricultural firms to reinforce consistency in material handling practices to ensure efficiency and safeguard product quality. While training and safety measures are in place, there is a need to standardize handling procedures, adopt modern equipment, and encourage the use of proper unit load designs to minimize handling time. Firms should also explore automation in handling processes to improve speed and reduce human error.

5.5 Areas of Further Studies

The focus of the investigation was Kenyan agricultural companies listed on the NSE. In order to compare the findings, the report suggests conducting additional research on the warehousing management techniques of businesses in different industries. In a similar vein, the study found that 75.9% of the variances in the supply chain performance levels of the agricultural

companies listed on the NSE could be explained by the warehousing management techniques used. Therefore, a second study that focusses on other warehousing management strategies that are not covered in the current study and account for 24.1% is required.

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APPENDICES

Appendix 1: Introduction Letter

Dear Sir/Madam

RE: Data Collection

My name is Judy Nyakundi, a KCA university student, pursuing a Masters Degree in Science in Supply Chain Management. As one of the requirement of the course, I am required to carry out a research project. My topic of research is “***Warehousing Management Practices and Supply Chain Performance of Agricultural Firms Listed in Nairobi Securities Exchange in Kenya***”. I have selected your firm as one of the firms where I will collect data to help me answer the research questions. Attached in this letter is a questionnaire that seeks to collect data on various aspects of warehousing management practices and supply chain performance. Am kindly requesting you to respond to the questionnaire as best as you can. All the information and responses you provide will be treated with utmost confidentiality and will be used for the study’s purpose only. As you respond, kindly remember not to capture your name or that of the agricultural firm in any section of the questionnaire. You have the right to withdraw at any stage of the study without any consequences.

Thank you in advance for your cooperation

Regards

Judy Nyakundi

Student, KCA University

Appendix 2: Questionnaire

Section I: Demographic Information

- a. Current Position
- i Warehouse Manager []
 - ii Supply Chain Manager []
 - iii Inventory Controller []
 - iv Operations Manager []
- b. Work experience in current role:
- i Less than 1 year []
 - ii 1–5 years []
 - iii 6–10 years []
 - iv Above 10 years []
- c. Highest level of education:
- i Diploma []
 - ii Bachelor's Degree []
 - iii Master's Degree []

Section II: Warehouse Layout Optimization

You are provided with various statements on warehouse layout optimization practices. Indicate your level of agreement with the statements using the given scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree.

Warehouse Layout Optimization	1	2	3	4	5
The warehouse layout allows for maximum use of available storage space					
Storage areas are organized to minimize unused or wasted space					
The arrangement of storage and work areas promotes smooth and efficient workflow					
The current layout reduces congestion during peak operations					
The warehouse layout can easily accommodate an increase in inventory volume					
The design of the warehouse allows for flexible reconfiguration when operational needs change					

Section III: Inventory Control Practices

You are provided with various statements on inventory control practices. Indicate your level of agreement with the statements using the given scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree.

Inventory Control Practices	1	2	3	4	5
The firm maintains accurate records of all inventory items at all times					
Inventory discrepancies are promptly identified and corrected					
The firm uses historical data to predict future inventory needs accurately					
Inventory forecasts are reviewed regularly to accommodate seasonal variations					
The firm has clearly defined reorder levels for all critical inventory items					
Reorder points are regularly reviewed and adjusted based on demand fluctuations					
The firm replenishes inventory promptly when reorder points are reached					

Section IV: Storage Management Practices

You are provided with various statements on storage management practices. Indicate your level of agreement with the statements using the given scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree.

Storage Management Practices	1	2	3	4	5
The storage facilities in the firm are well-protected against theft and unauthorized access					
Our firm implements strict access control measures to safeguard stored agricultural products					
Our storage practices minimize product spoilage					
Proper handling and storage procedures are in place to reduce wastage					
Our storage facilities can easily accommodate changes in the type and volume of products stored					
The storage facilities are flexible enough to adapt to seasonal inventory fluctuations					

Section V: Material Handling Practices

You are provided with various statements on material handling practices. Indicate your level of agreement with the statements using the given scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree.

Material Handling Practices	1	2	3	4	5
The firm groups materials into unit loads to facilitate movement and storage					

Proper unit load design is applied to minimize handling time					
Standardized equipment and containers are used for material handling throughout the warehouse					
Standard procedures are applied when handling all types of materials to ensure consistency					
Employees are trained to follow standardized handling methods to reduce errors					
Safety guidelines are strictly followed during material handling in the warehouse					
Proper handling equipment is provided to ensure the safety of staff and materials					

Section VI: Supply Chain Performance

You are provided with various statements on supply chain performance. Indicate your level of agreement with the statements using the given scale: 1=Strongly Disagree, 2=Disagree, 3=Neutral, 4=Agree and 5=Strongly Agree.

Supply Chain Performance	1	2	3	4	5
Our firm effectively minimizes operational costs in warehousing and distribution					
We consistently achieve cost savings through improved supply chain practices					
Our supply chain can quickly respond to changes in customer demand					
Orders are processed and delivered to customers in a timely manner					
We have systems in place to quickly resolve supply chain disruptions					
Our supply chain maintains consistent performance even during market fluctuations					
The firm ensures continuity of supply to meet customer demands over the long term					

Appendix 3: List of NSE Listed Agricultural Firms

1. Kakuzi Limited
2. Kapchorua Tea Company
3. Limuru Tea Co.Ltd
4. Williamson Tea Kenya
5. REA Vipingo Plantations Limited
6. Eaagards Limited
7. Sasini Limited

Appendix 4: Work Plan

Activity	June-2025				Aug.-2025				Sept.-2025				Oct.-2025			
Supervisor's appointment																
Selection of Topic and approval																
Drafting proposal																
Incorporating reviews from supervisors																
Defending Proposal and incorporating panelists' suggestions																
Apply for data collection letter and NACOSTI Permit																
Piloting the questionnaire																
Collecting and analyzing data																
Review of draft by supervisor																
Defend project																
Incorporate suggestions from the panelists and submit finals awaiting graduation																

Appendix 5: Budget

Item Description	Cost- Kshs
Stationery and cyber services (printing and editorials)	15000
Travel Expenses for data collection	15000
Data analysis services	30000
Miscellaneous	20000
Total	80000

APPENDIX 6: REQUEST FOR ETHICAL REVIEW FORM



RESEARCH, INNOVATION, AND OUTREACH DIVISION

KCA UNIVERSITY SCIENTIFIC AND ETHICS REVIEW COMMITTEE

REQUEST FOR ETHICAL REVIEW FORM

The request must include the following information for the research to be considered for approval:

Name, institution, and contact details (email and phone number) of the principal/lead investigator/researcher:	Institution: KCA University Name: Judy Nyakundi Email: 2404442@students.kcau.ac.ke Mobile: 0723700077
If it is a thesis, include also the name(s), institution(s), and contact details (emails and phone numbers) of the supervisor(s):	Name: Dr. Rebecca Mutia Institution: KCA University Email: rmutia@kcau.ac.ke Mobile: 0722790837
Date of request:	11/09/2025
Title of the Research:	WAREHOUSING MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE OF AGRICULTURAL FIRMS LISTED IN NAIROBI SECURITIES EXCHANGE IN KENYA
Planned or confirmed source of funding:	Personal funding
Members of the research group and their roles in the implementation of the study, as well as possible cooperation with other universities, research institutes, or similar organizations:	Judy Nyakundi: Principal Researcher Dr. Rebecca Mutia- Research Supervisor

What is the level of risk presented by your research?	Please indicate whether the research risk assessment (Check risk document) stated on the application is: ☒ Low risk (<i>Research has no foreseeable risk of harm, discomfort, or inconvenience to respondents</i>) ☐ Medium risk (<i>Research has potential risk of unexpected negative consequences, harm or discomfort, but where appropriate steps can be taken to mitigate the risk</i>) ☐ High risk (<i>Research with real and foreseeable risk of harm and discomfort to participants and or the research team, and which may lead to serious adverse consequences if these risks are not managed in a responsible manner. It involves highly sensitive topics and/or the participation of very vulnerable and marginalized individuals/groups</i>)
Would you like to bring any aspects of the applications to the Ethics Review Committee's attention?	Please indicate them here N/A
What research data will be collected?	Primary data
What personal data and confidential information will be processed?	Position Experience Level of education
Specify any special category or sensitive data that will be collected (tick all that apply)	☐ Ethnicity ☐ Mental Health (status, medical records conditions, to include disability) ☐ Physical Health (status, medical records conditions, to include disability) ☐ Sexual Orientation/Sexual life ☐ Genetic Data (to include DNA data) ☐ Biometric data (such as facial scan, iris scan, or fingerprint data used to identify a participant) ☐ Political opinions ☐ Trade Union membership ☐ Religious or philosophical beliefs ☐ Criminal Convictions and offences (to include alleged offences and convictions) ☒ None ☐ Other – Please specify below

How will data be stored and transferred during the research?	Coded data will be stored in a password-protected computer Physical questionnaires will be kept safely in a lockable cabinet
Specify who will be able to access the identifying information and how you will ensure they process the information securely	Researcher, Supervisor and KCA School of Business
How will research data be preserved and shared on completion of the project? (NB: <i>Enter N/A in this section unless results will be published</i>)	Coded data will be stored in a password-protected computer Physical questionnaires will be kept safely in a lockable cabinet
Describe the measures that will be taken to ensure data are suitable for sharing, e.g., securing consent, anonymizing data prior to deposit/sharing, and sharing confidential or high-risk information using a controlled access repository.	A consent will be sought from the respondents. Respondents will not be required to indicate their names or that of the firm in any section of the document
State how long you plan to retain personal data and any confidential information after the end of the project. Indicate also how the data will be disposed	<i>The data will be kept for 6 months. Computer stored data will be completely deleted while the physical questionnaires will be shredded</i>

As the Principal Investigator of this study, I declare that I take full responsibility for the proposed study and will conduct it according to the documented proposal and in line with KCAUSERC ethical guidelines.

By signing this document, I agree that:

- a) All documents submitted with this application are true representations of the study and have not been falsified.
- b) This study will not commence in any way, and no participant will be recruited until final official approval is received from KCAUSERC
- c) The study will be conducted according to the protocol submitted. All participants will be recruited and consented to according to the protocol.
- d) Any protocol deviations or protocol violations to the submitted study must be

- reported to KCAU in writing by email to KCAUSERC immediately. Within five (5) business days of the deviation or violation, the Deviation/Violation Must be reported to the ISERC office.
- e) Any study-related unexpected or serious adverse event must be reported to the ISERC Office by email within twenty-four (24) hours after the PI becomes aware of the event.
- f)
- Principal Investigator's Signature J.N Date 11/09/2025

INFORMED CONSENT FOR RESEARCH PARTICIPATION

Introduction

You are invited to participate in a research study. This document provides information about the study so that you can make an informed decision about your participation. Please take the time to read the information below. If you have any questions, feel free to ask the researcher. **(PI to Fill in the sections italicized)**

Purpose of the Study

The purpose of this study is to establish the **WAREHOUSING MANAGEMENT PRACTICES AND SUPPLY CHAIN PERFORMANCE OF AGRICULTURAL FIRMS LISTED IN NAIROBI SECURITIES EXCHANGE IN KENYA**. The research is being conducted as requirement **IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS DEGREE IN SCIENCE IN SUPPLY CHAIN MANAGEMENT (KCA UNIVERSITY)**.

Study Procedures

If you agree to participate, you will be asked to fill the questionnaires, the whole process will take one week after which I will pick the questionnaires for analysis.

Potential Risks and Discomforts

There may be some risks associated with participation in this study. These risks may include *stating your gender, ethnicity and religion*. Every effort will be made to minimize these risks, and you can withdraw from the study at any time without penalty.

Potential Benefits

While participating may not directly benefit you, the results of this study may contribute to enhanced knowledge to the procurement professionals.

Confidentiality

Your participation will be kept confidential. Any data collected will be stored securely and only accessible to the research team. Your identity will not be revealed in any publication or presentation resulting from this research.

Voluntary Participation

Participation in this study is completely voluntary. You have the right to withdraw from the study at any time without any negative consequences or loss of benefits to which you are otherwise entitled.

Questions

If you have any questions about this study, your participation, or your rights as a

participant, please contact the principal investigator at 2404442@students.kcau.ac.ke OR 0723700077.

Consent

By signing below, you indicate that you have read the information provided above, understand the purpose and procedures of the study, and voluntarily agree to participate. You can withdraw from the study at any time without penalty.

Participant Statement:

I, the undersigned, consent to participate in this study.

Name of Participant: _____

Signature of Participant: _____

Date: _____

Researcher (Principal Investigator –PI) Statement:

I, the undersigned, confirm that I have explained the nature of this study to the participants, answered all questions, and ensured that they understand the information provided.

Name of Researcher: _____ JUDY NYAKUNDI _____

Signature of Researcher: _____ J.N _____

Date: _____ 1/09/2025 _____